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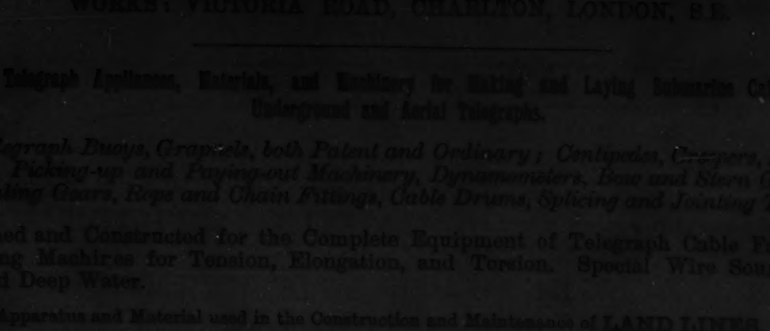

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THE TELEGRAPHIC JOURNAL AND
Electrical Review.
VOL. XIII.—NO. 314.

THE DISTRIBUTION OF ELECTRICITY.

THE "secondary generators" of Messrs. Gaulard & Gibbs are now perhaps attracting more attention than anything which has yet been brought forward for electric lighting purposes. We dwelt, at some length, in our pages of last week, upon their installation for lighting several of the Metropolitan Railway Stations, and in our present issue will be found an illustrated description of the apparatus employed, which differs in several particulars from the form of induction coil previously described by us, and shown in action during the late exhibition at the Royal Aquarium, Westminster. The arrangements on the Underground Railway appear to have been, thus far, quite successful as regards the production of the electric light, but we have yet to see the effects of prolonged working on the line wire conveying the primary current. A contemporary remarks:—"To what extent the potential can be raised is a moot question, but appearances tend to prove that it can be multiplied to several times its present figure if the insulation be carefully attended to." Now the electromotive force employed is 2,000 volts, and if we increase this to 6,000 or 8,000 volts what will be the result? Any conductors placed underground may be said to be in the same condition, so far as chances for leakage are concerned, as those placed under water. A submarine cable having, say, an insulation resistance per mile of 1,000 megohms, or 1,000,000,000 ohms, is rarely worked by a battery having a greater electromotive force than 40 volts, and this, be it remembered, a continuous current. We have already heard rumours to the effect that the leakage in the line wires attached to the sides of the tunnels of the Underground Railway, and exposed to steam, moisture, and other ill effects, is at present something considerable. This is only to be expected under the circumstances, for if a faulty cable has to be broken down, by means of rapidly reversed currents, it is but on rare occasions that an electromotive force of more than 500 volts is required to be employed. Our contemporary further adds:—"The cost of a conductor to carry the current directly for lighting by incandescence on a circuit of 15 miles would be perfectly prohibitory to any scheme." So, we expect, will be the cost of the insulation for the high-tension currents now proposed. The Suez Canal scheme, indeed, was to be carried through by means of machines producing 40,000 volts. Leaving this matter, however, to be decided by actual experience, we will ask whether much the same results as those achieved by Messrs. Gaulard & Gibbs cannot be obtained by other well-known systems? Could not the Anglo-American "Brush" Corporation or the Jablochkoff Company accomplish such an extensive range of lighting by the simple method of substituting incandescence lamps for arc lamps where required? Something in this direction has already been done, but we think that much more might be effected, and the success of Gaulard & Gibbs should act as a stimulus to these companies, and especially to inventors of secondary batteries. With these latter apparatus, when quite to be depended upon, an accident to any portion of the *line* wire need not necessarily affect the burning of the lamps wherever they may be, but a break in the line would be fatal to the "secondary generators." We do not make these comments for the purpose of disparagement—far from it—but simply to bring to mind certain objections which must be overcome. Nobody would be more ready to welcome heartily the success of the "secondary generator" idea, as a convenient means for the distribution of electrical energy, than ourselves, and we believe that the system may be improved in several important respects. But, as with the experiments of M. Marcel Deprez on the electrical transmission of power, we cannot accept mere statements of what can be accomplished without they are accompanied by uncontrovertible evidence which will either prove or negative such statements. It is to be hoped that the directors of the Metropolitan Railway may see fit to arrange for a series of tests now that to all outward appearances the "secondary generators" have shown themselves capable of doing so much of that which is claimed for them.

ELECTRO-MOTORS IN PRACTICE.

(A COMMUNICATION.)

IN all workshops where electro-motors are to be used, two points must be considered—one, that every machine shall have its proper speed, and the other, that the power which the motor is giving off shall be known.

Probably, and in most instances, there will be some second motor (non-electric) to depend upon, and in such cases the mainshaft must have a regular speed, say, of 150 revolutions per minute, or else the speed of the motor must be varied for the particular machine in use, and in the case of a steam or gas-engine this is an inconvenient thing to do. If an electro-motor alone is employed, all the pullies may have their diameters so calculated as not to necessitate a constant speed for the mainshaft. All governing apparatus for electro-motors are more or less complicated and the following simple way of erecting shafting is suggested:—Make each secondary shaft or set of countershafts running off the mainshaft (the machines being placed in rows), have a definite speed and let the machines be so disposed that those in every row each absorb about the same H.P. Then all that is necessary is to have an electro-motor for the maximum power required at the correct speed for one shaft, and for all others place small resistances in the motor circuit, which is practically no loss if accumulators or shunt generators are employed. Thus, suppose the mainshaft to run four rows of machines, then three resistances would be required, if the speeds are different for each row, so that the starting switch would require four steps, three for resistances of carbon and one "full on."

An extra resistance of a quarter of an ohm makes a great difference in the speed of an 8 or 10 H.P. motor working under a load.

Now, the E.M.F. alone regulates the speed, all other things being equal, but the current increases with the load, so that to get the same speed with a heavier load, the E.M.F. must be increased. In other motors, such as a steam-engine, if work is put on requiring a definite speed, and this speed cannot be obtained, the engine is too weak and no increase in the size of the pulleys will alter the speed, supposing the limit of the engine's power has been reached, except by increasing the boiler pressure, which may be compared to an increase of the E.M.F., and which is generally impracticable.

But in the electro-motor for a certain load, if the speed is too low, it can always be increased by altering the pulley diameters, provided always that the limits are within the power of the motor. Hence, the greater the load, the larger the primary pullies, to obtain the same speed which a lighter load would have; because the greater the power the motor is giving off, the slower its speed, whereas in other motors, when they are so loaded that they run slower, it is that they are not sufficiently powerful for the work. It is here assumed that the E.M.F. is constant.

There is a very simple method of approximately measuring the power absorbed. Thus, suppose the E.M.F. to be constant at 100 volts and allow 25 per cent. as loss, which is a very fair estimate; then we have—

$$\text{H.P.} = \frac{\text{C. }100}{746} = \text{approx. C. }\frac{100}{750} = \frac{2}{15}\,\text{C}$$

and if waste = 25 per cent., then H.P. actual

$$= \left(\frac{2}{15} \times \frac{3}{4}\right)\text{C} = \frac{\text{C}}{10}$$

hence, H.P. $= \frac{\text{C}}{10}$ very nearly, or whatever may be the reading on the ammeter, put a decimal point one place from the right and read the ampères as H.P.; for example, suppose the reading is 28 ampères (volts = 100), the H.P. given off=2·8. If the E.M.F. has any other value the constant will vary, but the principle remains the same. So sensitive is this method, that any shaft not being properly oiled, or any extra friction, is detected in a moment, supposing all the machinery has been carefully tested in the first instance to ascertain how many ampères are required in each case. It is surprising how little will increase the current by one or two ampères (100 volts), signifying as it does a loss of ·1 or ·2 H.P. for want of oil or of some other increase of friction. Such means of easy and rapid detection are not to be found in any other motor known.

Here is appended some approximate and rough workshop tests made on the above method with an S D_2 machine of Siemens. Its maximum power is nearly 10 H.P. and the current had an E.M.F. of 100 volts. The waste is not more than 15 to 20 per cent. when working at high power; but 25 per cent. for loss or waste is assumed as a fair average, because it is not easy to have everything in perfect adjustment in general practice.

Speed per min.	Ampères.	H.P.
1,100	47	4·7
1,200	30	3·0
1,350	22	2·2
1,450	13	1·3

These speeds differed in consequence of the variation in the load, and the H.P. given in the above table, approximated very closely to the actual work put on the machine, although these figures were obtained by the arbitrary method above referred to. By running the S D_2 free (*i.e.*, on loose pulley), and placing a carbon resistance of 1 ohm in the circuit, the speed was diminished to 1350, whereas the current dropped to about 8 ampères, or actually to $\sqrt{\frac{3}{2}} \times 6{\cdot}09$ ampères, 6·09 being the number of ampères for one degree of deflection on the dynamometer.

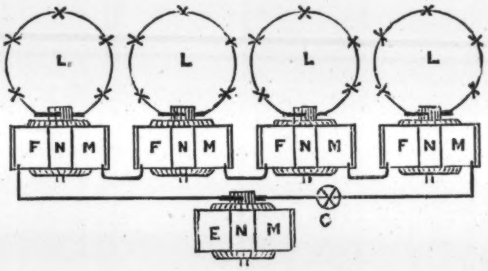
D. S.

DYNAMO MACHINES FOR ELECTRIC LIGHTING.

(A COMMUNICATION.)

SOME years ago, I believe, that eminent electrician who has now gone to his long rest, the late Sir William Siemens, said that electric lighting by continuous currents was some 30 per cent. more economical than is the case when alternating currents are employed. It is, indeed, generally understood that rapid alternations in machines produce a certain loss of energy which continuous current machines are free from. Let this, however, be as it may, alternating currents are, or have so far been, essential to the successful working of certain systems. The Jablochkoff candle is an example, and perhaps the most prominent of its kind, of the necessity of employing alternating current machines. Attempts have been made, notably I think, by the late Antoine Breguet, to employ continuous currents, practically speaking, for supplying such candles. These currents were reversed, if I am not mistaken, at regular intervals, but not very rapidly, by a commutator attached to the axle of the dynamo. The results attained, however, were not practically successful, whether owing to the burning of the commutator, or from other causes, I am not prepared to say. A difference in the sizes of the two carbon pencils has also been suggested by many, including Jablochkoff himself, but I do not know of any successful application of this method.

Some years ago, shortly after the introduction of the Jablochkoff system into England, I was led to experiment with the candles, and the idea of using continuous current machines, the only ones at my command, naturally struck me as being possible. Unfortunately, however, I was never able to carry out my desires in the way intended, and I therefore beg to place my suggestion before your readers, thinking that perhaps some one may be able to decide as to whether the plan I propose has any value or not. It is, as far as I am aware, original to myself. Previous attempts at the employment of continuous currents have generally been in the direction of reversing the current of the *generator* by means of a commutator. My plan was to use several small machines giving sufficient current, say, for 5 or 10 candles each. I intended that the field-magnets of these machines should not have any connection with the respective armatures or bobbins of each, but that they should be magnetised by a separate exciting machine. To this latter machine I meant to attach a commutator in such a way that, at stated intervals, say every 15 or 30 seconds, the direction of the current would be reversed, and therefore the magnetism of the field-magnets in the generating machines be reversed also. Currents in opposite directions would therefore have been sent through the candles at given periods. The sketch will clearly show my proposed arrangements.



E, M is the exciting machine, in circuit with which is the commutator, C. This commutator acting at stated intervals, would change the direction of the current passing round the field-magnets of the generators, F, M, and, therefore, their magnetism; the result of this would be that currents in reverse directions, say every 15 seconds, would pass through the circuit of candles, L. The commutator might be arranged in a similar manner to that adopted by Brockie for making and breaking the shunt circuit in his first electric lamp, which thereby lifts or lets fall the upper carbon rod every minute or so.

As I have said before, this arrangement has not actually been tried, and therefore I cannot say from experience what the result of such a device for employing continuous currents might be.

I had thought that by reversing the current in the field-magnets of the generators, instead of reversing the light-giving current, that by a proper winding of these electro-magnets and a special exciter, a reduced current might be made to do the work of magnetisation and therefore reduced sparking at the commutator would follow.

It might be said that it takes time to reverse the magnetism in the field-magnets, but this objection would hardly hold, as the Jablochkoff candles will become re-ignited some seconds after the current has been interrupted even.

What effect might be produced on the collectors and brushes of the generators I cannot say, but I imagine it would be somewhat similar to that on the reversal of direction of an electro-motor used for driving purposes.

I do not know that I should have communicated this matter to the ELECTRICAL REVIEW had it not struck me that a commutator, on the plan of the Rapieff apparatus, illustrated in your JOURNAL of December 15th, 1879, might be constructed to effect such an object as I had in view. I imagine that the blinking which would probably occur in the Jablochkoff candles on each reversal of current, would be but momentary, and as unnoticeable as that in the Brockie lamp to which I have already alluded.

MUSICUS.

ELECTRIC TIME SIGNALS.*

A Description of the Electric Time Signal, at Port Elizabeth, Cape of Good Hope.

By S. ALFRED VARLEY, Assoc. Mem. Inst. C.E.

THE progress made in the application of electricity to time signalling has been brought under the consideration of this section at more than one meeting of the Association.

In the year 1850, the Astronomer Royal applied electricity to time signalling.

In 1854, the British Association met at Liverpool, and in that same year a time ball acting in sympathy with the Greenwich Observatory ball was erected at Liverpool.

It so happened, the author at that period had the charge of the telegraphs belonging to the Electric Telegraph Company, in the Liverpool district, and the superintendence of the Liverpool time ball fell to his charge.

The discharging a time ball weighing 4 cwt. by electricity, from a distance of over 200 miles, was the greatest feat of its kind up to that time.

The circumstance of the British Association again meeting at Liverpool has suggested to the author that a description of the time ball erected at Port Elizabeth, for the benefit of the shipping in Algoa Bay, and which is daily discharged from the Royal Observatory in Cape Town, a distance of 500 miles, would be of interest to the Association.

This time ball is discharged by a through current from Cape Town; that is to say, there is no relay or intermediate apparatus between the Observatory and Port Elizabeth, the trigger being discharged by the galvanic battery at the Observatory. There are some points of interest connected with the Liverpool time ball which have not been published, and a brief description of the signal may be useful; but the subject of time balls having been before this Association on former occasions, it is scarcely necessary to enter into lengthy details.

The Liverpool time ball, which was made of zinc, and weighed 4 cwt., was attached to a strong iron rack, on the lower end of which there was a piston, and when the ball was discharged, after it had passed through a clear space of 2 ft., the piston entered a cylinder compressing the air in its descent; the compressed air formed a cushion to receive the ball, and was allowed to escape through a tap fixed into the lower portion of the cylinder; this enabled the rate at which the air escaped, and the rate of the final descent of the ball to be regulated.

The ball was raised by means of a pinion working in the rack, and when wound up, and the pinion thrown out of gear, the piston rested upon a strong steel detent, the other end of which rested against a friction roller fitted into one end of a right angular lever. The pressure exerted on the right angular lever was entirely vertical.

A second lever pressed against the underside of the lever, and on this second lever a hammer impinged. Attached to the axle upon which the hammer worked there was a lever having a friction roller which rested against a horizontal plane of polished steel fixed to a vertical lever, which worked on a pivot at its lower end. A long light lever, mounted upon a delicate axle, and having a curved arm projecting on the other side of the axle, rested upon the top of a lever, to the lower end of which was attached a soft iron armature.

The armature was retained a short distance from the poles of an electro-magnet, by means of a delicate spring, and when the electro-magnet was rendered active by closing the electric circuit through it, the armature was attracted, the lever fell, knocking away the vertical lever, liberating the hammer, the impact of which on the lever, acted upon the right angular lever, released the detent, liberating the ball which fell by its own gravity. The hammer and the other levers were actuated by springs to make their action more rapid. The electrical arrangements were as follows: The Greenwich Observatory clock closed an electric circuit at 1 p.m. This current discharged a time ball on the top of the telegraph office in the Strand, and entered the earth at the chief London telegraph office after passing through an apparatus designed by Mr. Culley, and termed the automaton, as it automatically closed several electric circuits, and relayed time currents from batteries in the London office to Liverpool, Manchester, and other chief towns. Shortly after the time ball at Liverpool had been got to work it was thought advisable to make some alterations in the trigger, and it was sent to Manchester to be altered, but after this had been done it was lost in its transit from Manchester to Liverpool, and a new one had to be constructed.

This second trigger was made at the Telegraph Company's stores in Manchester, and some improvements were effected in its construction.

The only thing which had to be done at Liverpool was to wind up the ball, adjust the trigger, and wait for the time current which discharged the ball at one o'clock.

The author soon felt it was very desirable there should be some check by which the Electric Telegraph Company could ascertain that the apparatus in their offices was working correctly, and he suggested arrangements for effecting this, and he also proposed a means of measuring the loss of time between receiving the Greenwich current in London and the falling of the time ball at Liverpool, for there necessarily was a loss of time, and it was desirable to ascertain the amount.

The elements of loss of time were:

1. The automaton occupied a small interval in closing the circuits after the current had arrived from Greenwich.

2. The time current was sent to Liverpool by an underground circuit, and an appreciable interval of time elapsed between the current leaving London and arriving at Liverpool.

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* Paper read before Section A of the British Association, at Liverpool, in 1870. See last week's ELECTRICAL REVIEW.

3. The trigger occupied time, discharging one lever after another.

The arrangements suggested and carried out were :

1. The hammer of the trigger, after liberating the detent upon which the ball hung, was made to divide the circuit so that electrical communication was broken by the apparatus itself immediately after its discharge, and at the same time that the circuit was divided the trigger hammer connected batteries at Liverpool on to a second wire, and sent a return current to London.

The Liverpool time wire passes through the Manchester Telegraph Office, to which a time current was also sent at one o'clock, and advantage was taken of this to obtain an additional check.

Two galvanometers were placed in the chief telegraph office in London side by side ; one of these was placed in the Greenwich time wire, the other in the return circuit from Liverpool.

In the Manchester office two galvanometers side by side were placed, one in the circuit of the Liverpool time wire, the other in the Manchester time wire. At Liverpool the time wire was also connected through a galvanometer in circuit with the electro-magnet of the trigger.

An observer in London noted the receipt of the Greenwich current, and the interval of time elapsing before receiving the return current from Liverpool.

An observer at Manchester noticed the simultaneous arrival of the time currents on the Manchester and Liverpool circuits, and the rapid cessation of the current on the Liverpool circuit consequent upon the dividing of the circuit by the trigger.

An observer at Liverpool also noticed the reception of the current, and its rapid cessation, indicating there was no hanging fire on the part of the apparatus at Liverpool. In this way a very complete check was obtained, and the galvanometers in the Liverpool circuit at Manchester and Liverpool in practice only swung over a space of 15 or 20 degrees, instead of being permanently deflected which they would have been if the apparatus had hung fire.

The interval elapsing between the receipt of the current from Greenwich in London and the discharge of the ball in Liverpool was $\frac{11}{20}$ths of a second. Of this time, $\frac{5}{20}$ths of a second were occupied by the current travelling through the underground wire between London and Liverpool ; $\frac{2}{20}$ths — a fraction were consumed in the automaton, and $\frac{4}{20}$ths + a fraction in the trigger.

The author constructed an electric chronograph to enable him to measure small intervals of time, making use of a Bain's telegraph machine for the purpose.

A Bain's telegraph consists of a train of wheels regulated by a fly, and driven by a weight.

A metal drum connected with the train communicates motion to a ribbon of paper prepared with ferrocyanide of potassium and nitrate of ammonia.

When the machine was started the ribbon of paper passed over the drum at the rate of 6 feet per second.

A piece of fine steel wire insulated from the drum pressed lightly upon the prepared paper, and the circuit was closed through the steel wire, the prepared paper, and the metal drum.

When the circuit was closed the ferro-cyanide of potassium was decomposed, the cyanogen combining with the wire forming prussian-blue, and as the paper was in motion a blue line was formed on it as long as the circuit was closed.

This machine gave the means of measuring time in space, and the way in which the author measured the loss of time in the trigger, for instance, was as follows : He placed the Bain's machine in circuit with the trigger, making the trigger to divide the circuit after discharge, as already described. The machine was started by the pendulum of a regulator, or the seconds-hand of a watch, and the electric circuit was closed by means of a contact maker. The electric circuit remained closed until the circuit was divided by the trigger recording a blue line on the paper. The paper was usually allowed to run until one minute was completed, and then stopped. The length of paper run out was then accurately measured, and also the length of the blue line. and from these two measurements the interval of time could be exactly determined.

In the year 1859 Sir Thomas Maclear, the Astronomer Royal of the Cape of Good Hope, inspected the electrical time signals in this country with a view to erecting time balls in connection with the Royal Observatory at Cape Town, and he remarked the greater rapidity of action of the Liverpool trigger, and this led to the author afterwards designing and constructing at different times two triggers for use in the Cape. Both these triggers discharged more rapidly than the Liverpool trigger. In September, 1864, the author was requested to construct a trigger for discharging a time ball to be erected at Port Elizabeth. The author considered the intervention of any relay or secondary apparatus to be objectionable. He therefore determined, if possible, to construct the trigger sensitive enough to be discharged by the batteries in the Cape Town Observatory. The trigger was constructed with a soft iron armature, rendered magnetic by induction from a powerful compound bar-magnet, and strongly attracted the soft iron cores of an electro-magnet. A spiral spring attached to this armature was so adjusted that it nearly overcame the magnetic attraction induced by the bar-magnet. The time current polarised the electro-magnet in the opposite direction to that induced by the bar-magnets ; and as the attraction between the armature and the soft iron cores was already almost overcome by the spiral spring a very small amount of polarisation in the opposite direction was necessary to release the armature, which was rapidly pulled away by the spiral spring, and the trigger discharged.

There were some other alterations made in the general mechanical construction of this trigger, but they may be regarded as matters of detail. The rapidity of discharge was very great—$\frac{1}{20}$th part of a second only elapsed between the arrival of the time current and the falling of the ball.

From a report in the Port Elizabeth paper of August 29, 1865, giving an account of the inauguration of this time signal, and forwarded to the author by Sir Thomas Maclear, it appears that the time elapsing between the time current leaving the Observatory at Cape Town and the receipt at Cape Town of the signal announcing the falling of the ball is only $\frac{1}{15}$th part of a second. The time which elapsed between the Greenwich current reaching London and the falling of the ball at Liverpool was $\frac{11}{20}$th of a second. In other words, the Algoa ball is discharged a distance of 500 miles in less than $\frac{1}{7}$th of the time of that of the Liverpool ball. What is being daily done in the Cape can, however, be best summed up by a short quotation from a letter the author received from Sir Thomas Maclear giving an account of the successful inauguration of this time signal.

After detailing the general arrangements, Sir Thomas Maclear goes on to state : "A few tentative signals having proved satisfactory, the 'preface' was issued from the Observatory at ten minutes before one o'clock, and at the instant of one o'clock the Observatory time ball clock closed the circuit discharging the Observatory ball, the Simon's town ball, 24 miles distant, the Cape Town time gun 3 miles distant, and the Port Elizabeth ball, distant 500 miles !"

The United and London and Globe Telephone Companies.—Following the information published by us on November 3rd, we learn that some arrangement has now been completed between these two companies. We have no detailed information as yet on the subject, but it is evident that some considerable change is about to take place in the latter company, as large reductions of its staff, the particulars of which we have at hand, are being made.

A New Departure in Electric Lighting.—A company paying a dividend to its shareholders.

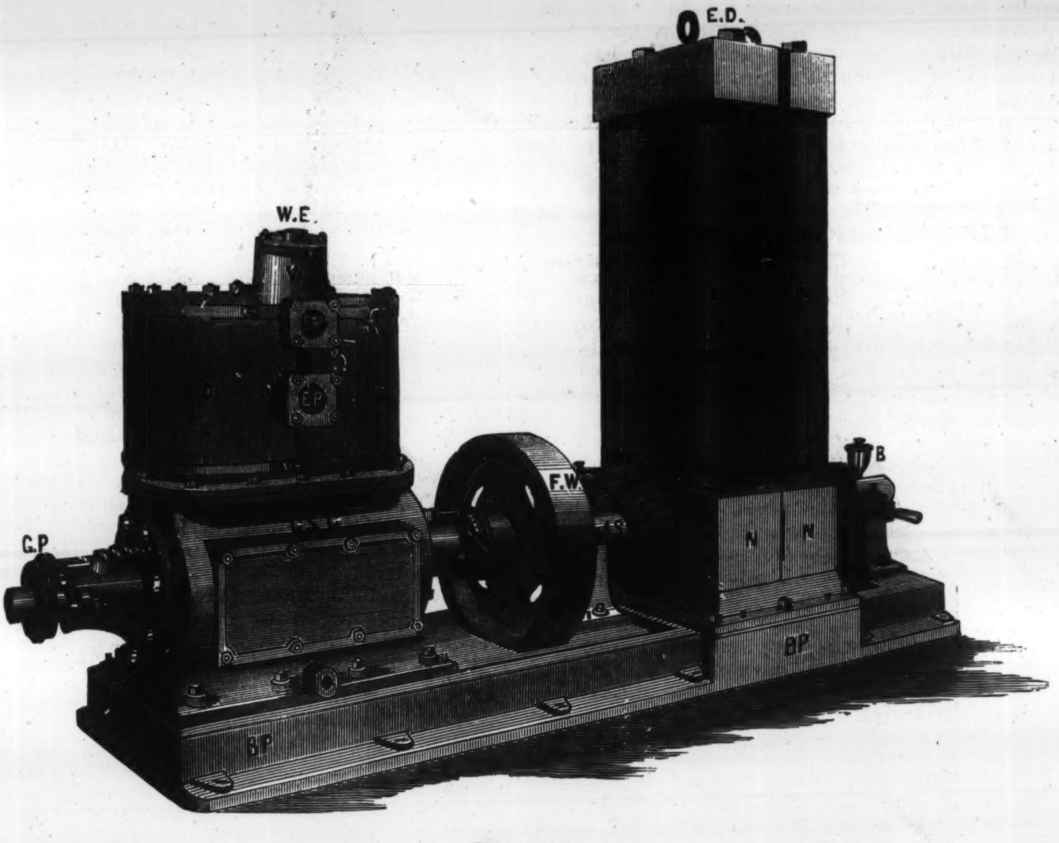
THE WESTINGHOUSE FAST SPEED ENGINE.*

WE illustrate a very neat and efficient form of fast speed engine, which has lately been adapted in this country by Messrs. Alley & Maclellan, of the Sentinel Iron Works, Glasgow, to driving electric light dynamos on board ship.

This engine has been fitted, with great success, on board the s.s. *Pateena*, built and engined by Messrs. A. & J. Inglis, Glasgow, and the s.s. *Adelaide*, built and engined by Messrs. D. & W. Henderson & Co., Glasgow, both for the Australian trade.

In these ships the electric light installations were carried out by the Scottish agency of the Edison Company, to the specification and under the supervision of Prof. A. Jamieson, C.E., F.R.S.E., Principal of the College of Science and Arts, Glasgow.

In the s.s. *Pateena* there were 160 Edison 16-candle power lamps, and in the s.s. *Adelaide* there were 131 lamps of 16 candles power and 4 of 100 candles each, the latter being for the purpose of facilitating the receiving and discharging of passengers and luggage when in port, and lighting up the spacious deck on any festive occasion.



DETAILS.

Where W,E, represents the Westinghouse engine
,, C_1,C_2, ,, ,, ,, ,, cylinders.
,, S, P, ,, ,, ,, ,, steam pipe.
,, V, C, ,, ,, ,, ,, valve casing.
,, E, P, ,, ,, ,, ,, exhaust pipe.
,, C, S, C, ,, ,, crank shaft casing (with crank shaft working in oil).
,, G, P, ,, ,, governor pulley (governor not shewn)
,, B, P, ,, ,, bed plate.
,, F, W, ,, ,, fly wheel.

Where A, S, represents the shaft coupled direct to dynamo spindle.
,, E, D, ,, ,, Edison dynamo.
,, E, M, ,, ,, ,, ,, electro-magnets.
,, N and S ,, ,, ,, North and South Poles.
,, A ,, ,, ,, Armature.
,, B ,, ,, ,, the brushes.

NOTE.—The whole engine and dynamo only occupy a space of 7 ft. 6 in. long × 2 ft. 6 in. broad × 6 ft. 3 in. high at the dynamo end only.

In each case the engines and dynamos were placed down on the ship's floors in a recess near the starting platform of the main engines, with the double object in view, viz., that they might easily be attended to by the engineer on watch at the main ship's engines, and to prevent any possible annoyance to the passengers from noise and vibration.

The normal speed of the engines was regulated by the governor at 525 revolutions per minute, which was found sufficient to generate an electromotive force of 90 volts, that being the electrical pressure required to give 16 candles in the specially made Edison lamps.

In each ship one of Buss's well-known tachymeters was fitted, as well as an Edison electromotive force alarum bell indicator, by which, and the usual test lamp placed near the dynamo, the engineer in charge was enabled to see that the plant was doing its duty. Close to the dynamo a switch-board was arranged, upon which the different switches for controlling the different sections were fixed, and the name of each section, as well as the number of lamps fed from each main wire, clearly lettered close to the switches. Besides those in the engine room independent main switches were fitted in handy positions throughout the ship, under the control of the stewards and petty officers, while each lamp was also fitted with a switch.

Fusible plugs were inserted in all the main and branch circuits, and special care was taken that the main and branch leading wires, which were supplied by the India-Rubber and Gutta-Percha Company, Silvertown, should not only be of extra size and conductivity, but also that they should be specially well insulated and jointed. All the positive and negative wires throughout these ships were, as far as possible, kept apart by being incased in wooden grooved scantlings or mouldings, so that there should be a minimum chance of short circuiting at any point. The whole system was carefully tested for conductivity and insulation and the dynamo and lamps for current, electromotive force, and candle power by the consulting electrician, as well as the capabilities of the engine and dynamo for admitting of any number of lamps being turned off or on at pleasure. It was found that in the case of the *Pateena* 159 out of 160 lamps could be suddenly switched out of circuit without damaging the last or remaining lamp at the dynamo, while similar experiments on board the *Adelaide* proved the efficiency of the engine after an equally severe trial.

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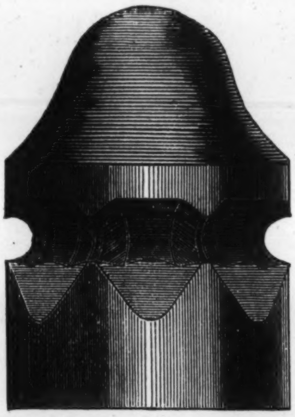
* We are informed on good authority that there are over 11,000 indicated H.P. of these small engines at work in America.

Such electrical and practical tests of an electric light installation, when properly carried out by a competent and independent electrical engineer, ensure shipping companies and shipbuilders receiving good material and sound safe construction for their money. We have often remarked that it would be to the advantage of the electric light contractors if they would agree, or rather insist, that their work should be specified for, inspected, tested and reported upon by a consulting electrician, for we are certain, that had this been more generally the case than it has been, many of the failures that we have heard of would have been averted, and the public confidence greatly strengthened in favour of the electric light.

THE FISKE-MOTT INSULATOR.

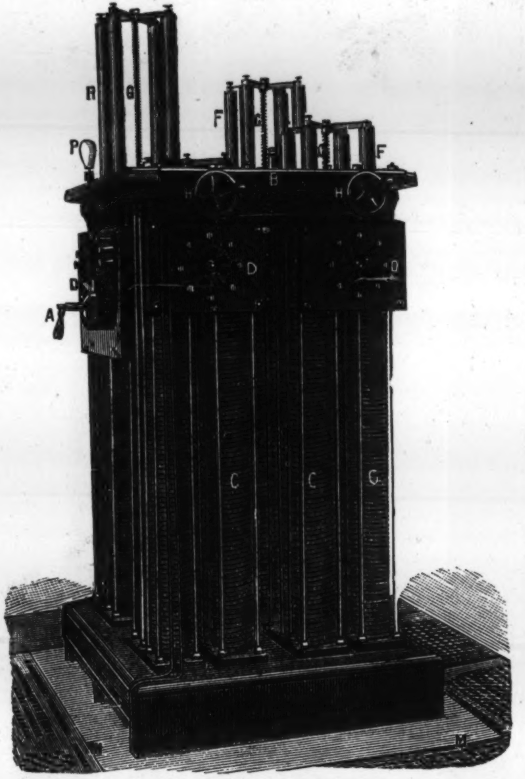
IN this insulator, which we notice in the *Electrical Review* of New York, the amount of contact surface between the wire and the insulator is decreased, the groove in which the line and binding wires are placed being simply corrugated. With this pattern the insulation is said to be about ten times as great as that given by the ordinary kinds, whatever this latter expression may mean in America. It is also claimed that in this insulator there is no place for the lodgment of water or dirt, and that it is kept quite clean by the action of the wind and rain. We believe the article is manufactured by the Chicago Insulator Company.



We may remark that practical experience has shown most conclusively that very little, if any, increase in the insulation of a wire is obtained by such contrivances as the above. Theoretically speaking, two wires, one laid upon and at right angles to the other, should not be in electrical contact, since the contact takes place at a mathematical point, but actually the contact may be of practically zero resisiance. The same is the case with insulators, for actually, the surfaces in contact, although apparently very small, are quite sufficient to enable the current to pass freely and thence to spread all over the surface of the porcelain and thus get to earth. To obtain high insulation in an insulator, *length* with small diameter is necessary.

THE DISTRIBUTION OF ELECTRICITY

OUR view of one of the Gaulard & Gibbs' secondary generators, as used for lighting the stations on the Metropolitan Railway, shows the principal features of the apparatus as described in our last issue. The line wire is connected to the terminals, B, and passing through the centre wire of the cable, C, C, which is constructed in the manner shown in our sketch last week, leaves by a terminal not seen in the drawing. The fine wires of the cable are brought to the commutators, D, by which they may be connected in tension or quantity, according to the current required. These commutators are worked by the movable handle, A. The handles, H, geared to the screws, G, work the brass cylinders, F, up or down, thereby exposing or covering the bars of iron in the centre of the columns. P is the pilot incandescent lamp indicating by its brilliancy when sufficient iron is exposed. M, M are Indiarubber mats placed round the generator to prevent any shock being received by the atttendant. The five secondary generators in use at Aldgate, King's Cross, Gower Street, Edgware Road and Notting Hill Gate, were manufactured by Messrs. Woodhouse and Rawson, whom we must compliment on the care and skill which has evidently been bestowed upon the apparatus.



FUNERAL OF SIR WILLIAM SIEMENS.

LAST Monday the remains of this noted scientific man were laid in the grave at Kensal Green Cemetery, after a service and funeral procession of such an imposing character as testified to the esteem in which the deceased had been held, and to the high position which he had attained in the world of science. Immediately after his death representations were made to the Dean of Westminster that it would be no unmerited tribute to eminence if the body of Sir William were buried within the precincts of the Abbey. The Dean, however, while expressing his sympathy with the objects of the memorialists, dwelt upon the extremely limited space in the Abbey, and on the very special claims which had to be urged as a condition of interment within its bounds. He, however, expressed his readiness to grant the Abbey for a service upon the occasion which should bear something of a national character. This proposal met with a ready acquiescence; and the funeral was therefore preceded by a choral service at Westminster, which, it is not too much to say, allocated a larger concourse of people than any public funeral since that of Charles Darwin. From an early hour the Abbey was besieged by a large crowd of the general public, and when the doors were finally opened the space available for these was filled to overflowing in a few minutes. In the Jerusalem Chamber the mourners and representatives of the various learned societies with which the deceased was connected assembled at about 11.30. Eight of their number were selected to be pall bearers—one from each of the principal societies in which Sir William had taken a prominent part. Professor Huxley represented the Royal Society (of which he is President), Sir Frederick Bramwell, the Society of Arts (of which Sir William was himself Chairman at the date of his death); Mr. Brunlees, the Institution of Civil Engineers; Mr. Percy Westmacott, the Mechanical Engineers; Sir William Thomson, the British Association; Professor Tyndall the Royal Institution; Mr. Willoughby Smith, the Telegraph Engineers, and Sir J. Ramsden, the Iron and Steel Institute. Punctually at 12, the hearse carrying the body from the residence of the deceased in Palace Houses, Bayswater, drew up at the Abbey. The coffin was carried into the choir, and the procession formed. After the members of the choir, who chanted the first portion of the burial service, was borne the coffin; its polished oak could hardly be seen from the mass of wreaths and flowers which covered it; and it was partially covered with a white silk and velvet pall, fringed with gold. The coffin, which simply bore the inscription "C. William Siemens, died November 19, 1883, aged 60 years," was placed immediately below the lantern, and Psalm 90, to Purcell's Burial Chant, was sung by the choir. The anthem which followed ("Happy is the man that findeth wisdom,") was composed by Dr. J. Frederick Bridge, for the funeral of Charles Darwin. The Dean then read the lesson, and Rev. J. Ellerton's hymn, "Now the labourer's task is o'er," was sung. The Dean pronounced the benediction, and the cortege left the Abbey by the north door, amidst the strains of the "Dead March." The choir and clergy preceded the coffin and formed a double line, through which the coffin was slowly borne. Among the clergy present were Canons Prothero, Duckworth, and Rowsell, Archdeacon Farrar and Minor Canons Cheadle and Price. Some confusion attended the reforming of the funeral procession outside owing to the pressure of the crowd; and it was not till nearly one o'clock that the last of the long string of mourning coaches and private carriages left the precincts of the Abbey. Occasional demonstrations of respect greeted the better known of the scientific men who were present.

The personal mourners included the brother of the deceased, Dr. Werner Siemens, and his wife; Mr. Frederick Siemens, of the Dresden Glass Works; Mr. Carl Siemens, Director of the St. Petersburg Branch of the firm of Messrs. Siemens Brothers & Co.; Mr. and Mrs. Alexander Siemens; Mr. Hermann Siemens; Mr. Arnold Siemens; Mr. and Mrs. Donald Gordon; Mr. Joseph Gordon; Mr. and Mrs. J. Laird; Captain Oldekopp, of the German Navy; Dr. Allen Thomson, &c., besides Dr. Dudgeon, Rev. Dr. Donald Fraser, and others.

Amongst the representatives of learned societies were the following: The Royal Society, represented by Mr. Norman Lockyer, Dr. John Evans, Sir J. Hooker, Dr. Hopkinson, Professors Michael Foster, Stokes, W. G. Adams, B. Price, Chandler Roberts, and Carey Foster. The Society of Arts: Sir Frederick Abel, Lord A. Churchill, Mr. A. Carpmael, Captain Douglas Galton, Admiral Sir E. Inglefield, Lord Sudeley, Sir P. Cunliffe Owen, Messrs. A. Cassells, H. Doulton, T. V. Lister, Owen Roberts, H. T. Wood (Secretary), and H. B. Wheatley (Assistant Secretary). Institute of Civil Engineers: Sir J. Hawkshaw, Mr. Hawksley, Mr. Bateman, Mr. Barlow, Mr. Abernethy, Sir Charles Hutton Gregory, Mr. E. Woods, Mr. G. B. Bruce, Mr. Charles Manby, Sir J. Coode, Sir R. Rawlinson, Sir J. N. Douglass, Mr. J. W. Barry, Mr Rendel, Mr. E. A. Cooper, Mr. J. Forrest (Secretary), and Mr. H. S. Eaton (Assistant Secretary). The British Association: Professor Bonney and others. Society of Telegraph Engineers: Sir Charles Bright, Lieutenant-Colonel Webber, Professor Hughes, &c. The Iron and Steel Institute: Mr. G. J. Snelus. Institution of Mechanical Engineers: Mr. G. B. Rennie, Mr. T. R. Crampton, Mr. R. Browne (Secretary), Mr. Ramsbottom (past President). Royal Academy: Mr. F. R. Pickersgill, R.A., as substitute for Sir Frederick Leighton. The Institution of Naval Architects: Mr. J. Wright, Mr. N. Barnaby, C.B., Mr. J. D. Samuda. The Royal Institute of British Architects: Mr. Horace Jones, President. The Chemical Society: Professor Roberts, Mr. Millar Thomson, Dr. Japp, Mr. Meldola. The Royal Institution: Mr. Warren de la Rue, Dr. Gladstone, Mr. W. Bowman (Hon. Sec.) Other societies which were specially represented were the Geological Society, the Royal Meteorological Society, the Physical Society, and the Society of Chemical Industry. The Royal Astronomical Society was represented by the President, and the German Athenæum by Count Gleichen, Mr. Alma Tadema, and Mr. Meyerstein. Mr. Andrew Cockerell, represented the Prince of Wales at the funeral ceremony. There were also present Count Munster (the German Ambassador), the Secretary to the Chinese Legation, Mr. Childers (Chancellor of the Exchequer), Sir Frederick Bramwell, Lord Bramwell, Lord Claude Hamilton, Mr. Shaw Lefevre, Mr. E. Graves (Engineer-in-chief of the G. P. O.), and Mr. Loeffler. Many societies had sent wreaths to place on the coffin.

The procession, as formed at the Abbey, consisted of about 80 carriages. The open funeral car, drawn by four horses, was followed by the family carriage and mourning coaches. Fourteen of the carriages were occupied by the employés of the Messrs. Siemens at Westminster and Woolwich, and a large number of their workmen also awaited the arrival of the procession at the cemetery. The route taken was by way of Victoria Street, Grosvenor Place, Park Lane, Bayswater Road, Westbourne Terrace and Harrow Road. At the grave side in Kensal Green Cemetery, the burial service was read by the Rev. H. R. Haweis. The weather, which up to that time had been favourable, suddenly broke, and a smart shower had the effect of dispersing the mourners immediately the service was concluded. A crowd of several thousands which had occupied the cemetery, remained for some time in the vicinity, curiously examining the grave which had received all that was mortal of so distinguished a man.

ELECTRIC LIGHTING IN THE FIRST AVENUE HOTEL.

WE had not space enough at our disposal last week to give any particulars concerning the opening of the First Avenue Hotel, Holborn, which took place on the evening of Thursday, the 22nd Nov. A large number of guests were assembled, and the evening was passed most agreeably and successfully. The electric lighting arrangements, which are on a scale of considerable magnitude, have, unfortunately, been hurriedly performed, and, as a consequence, we learn that some days must elapse before the installation is regularly and smoothly in operation. The following particulars will, however, give our readers a concise description of the work.

The whole of the electroliers and brackets throughout the hotel, with the exception of the three top floors, have been made by Messrs. Verity & Sons, of King Street, Covent Garden. The electroliers, &c., on the ground floor are most elaborate, being throughout in the Italian and French Renaissance style, and finished in the firm's "special gold colour." The most noteworthy are four "electrolabra" in the vestibule. The designs of these, as well as the rest of the work, have been made by the firm's own artist, S. Crichton-Hannah. The electroliers, 16 in number, in the grand and secondary dining rooms are of unique design and very handsome. There are 14 electroliers in the buffet and grill rooms, of a very exceptional character, being worked in square metal. Besides these there are four electroliers in the reception room and four in the library. The smoking and billiard rooms and staircase have 22 electroliers of almost as elaborate description. The majority of the bed rooms and sitting rooms have been fitted with brasswork by Messrs. Verity, some of the small electroliers being very elegant.

The dynamo-electric machines, with their fine engines, are in duplicate, each set independent of the other, and capable of doing the whole work.

The engines, which are a very simple and efficient adaptation of the compound system, have been designed and built by Messrs. John and Henry Gwynne, Hammersmith Ironworks, W. They have steam cylinders 11 in. and 17 in. diameter, working with a boiler pressure of 100 lbs. per square inch, and they run with great regularity at a speed of 300 revolutions per minute.

Steel shafts with large wrought iron pulleys are coupled directly to the engines, and power is transmitted to the dynamo machines by bands. These engines are much admired, and we need hardly say that for strength, graceful appearance and beautifully perfect workmanship they fully sustain their maker's well-deserved reputation.

The "1,000-light" dynamos are on the "Ferranti" system, and are so arranged in connection with a switch-board that each machine can do the work necessary for half the number of lamps. In case of accident, however, to either machine, its fellow generates the whole current. The machines and engines are in an underground building some yards from the hotel, so as to reduce noise or other inconvenience. An Adamson boiler is employed for generating the steam-power. The lamps are those of Swan, and number 1,200.

Among other attractions, the proprietors have provided for those staying at the hotel every facility for becoming acquainted with financial and ordinary news during the 24 hours, having contracted with the Electric News Telegraph Company, of 4, Ludgate Circus, E.C., for supplying six of their telegraphic printing instruments, three of them giving general and three Stock Exchange news. These instruments were in full working order, and created much interest among the numerous guests assembled on the opening night.

THE METROPOLITAN BRUSH ELECTRIC LIGHT AND POWER COMPANY, LIMITED.

IN our other columns will be found a "note" stating that dissent from the policy of the board on a point of *principle* has occasioned the loss to the above company of the services of its very energetic and capable manager. What can this mean? It is said to be an open secret that Mr. Pollock's quarrel with the board is solely this, that the shareholders' interests have been sacrificed (on the question of the recovery of purchase-money) to those most inimical to their interests, whereas it was the first duty of that body to have protected them, even if it involved the severance of congenial associates.

The company, it will be remembered, was formed to work the Brush system of electric lighting within the metropolitan postal districts, and to adopt an agreement of the 15th May, 1882, between the City and Suburban Electric Company, Limited, and Arthur Davis (for the Metropolitan Company). The abstract from the official register relating to the company will be found on p. 366 of the ELECTRICAL REVIEW for May 20, 1882.

Also on the same page will be noticed the abstract from the Official Register referring to the above-mentioned City and Suburban Electric Light Company, Limited.

The City and Suburban Company having been wound up within four months of its birth, no returns had necessarily to be, nor, so far as we can make out, have they been, filed. We believe the Metropolitan Company's subscribed capital amounted to £500,000, of which only £300,000 has as yet been called up. The vendor company paid the expenses up to the allotment, and the Metropolitan Company paid £235,000 for the rights which it possesses, of which £175,000 was payable to the Brush Company and £20,000 to the Hammond Company for the Westminster concession.

Thus it will be seen the vendors got a gross profit of £40,000, but besides this, £25,000 seems to have disappeared somewhere, for if our readers will take the trouble to turn to p. 59 of the issue of the REVIEW of January 20, 1883, it will be seen that the amount admitted to be received by the Anglo-American Co. was only £150,000, not £175,000. Now we should like to know what became of the difference? Could the vendor company have been so greedy as to take £25,000 more than the £40,000 which appears to have fallen to its portion? Sir Henry Tyler refers us (see p. 79 ELECTRICAL REVIEW, January 27th, 1883), to Messrs. Walter Webb & Co., who, it will be noticed, were the solicitors to the vendor company as well as to the Metropolitan Company!! Wherever it may have gone, an impression has been gaining ground of late, that some, at least, of the £235,000 is recoverable, and should be returned to the shareholders' pockets. If this be so the directors have taken a great responsibility on themselves in retaining interested, instead of disinterested, guidance, for it is clearly the duty of the directors to sift the matter to the very root. If they neglect so to do, they only render themselves equally liable with those whose conduct they would appear desirous of screening.

Very soon a meeting of this company must be held; it will then rest with the shareholders whether the remainder of their capital shall be utilised to work the 23 Provisional Orders, obtained by the company, to a profit, which can only be done by a competent directorate, altogether dissociate from the promoters, or whether they will be satisfied to leave it in the hands of the existing management.

It is, in these days of fraudulent and absconding secretaries, gratifying to meet with an instance in which an official of a company has, apparently, faced dismissal from a lucrative position in vindication of the shareholders' interests.

In conclusion we may mention that the vice-chairman of this company is that same Mr. Dickson who has recently exchanged the functions of the managing director of the Scottish Brush Company for those of its official liquidator.

REVIEW.

Public Companies "from the Cradle to the Grave;" Or, how Promoters Prey upon the People. By JAYCEE. London: Wyman & Sons, 74—76, Great Queen Street.

This is an amusing book, commencing with a chapter giving the history of joint stock enterprises from the passing of "The Joint-Stock Companies Act of 1862." Afterwards follows a chapter of "definitions," written in a humourous way, defining the meanings of such terms as "joint-stock company," "promoter," "syndicate" (the author says some are of opinion that the first syllable is a corruption of the common English word "*sin*"), "vendor," "director," "secretary," "member or shareholder," &c. It will be sufficient to give one instance only to give a general idea of this part of the book. "The duties of a member or shareholder," says our author, "are comparatively light, being merely 'to supply the funds required for promotion money, purchase of the vendor's *rights*, and the wherewithal to support the directors and staff,' what remains being applicable to the *other purposes* for which the company exists. These disbursements come out of a general fund called the 'capital of the company,' the greater amount of which it was the shareholders' privilege to supply."

Next comes a chapter on "Companies from the Cradle to the Grave," headed with the quotation "They have their exits and their entrances." It says: "The initiatory steps in the formation of a company are very easy of application; and in this respect the Acts have evidently proceeded on the assumption that 'man is perfect.'"

Some very useful information is given herein, detailing the various steps to be taken in the formation of a company.

Chapters with such titles as "Baits for the Unwary," "Word-Painting and other Illustrations," bring the reader to the subject: "The Indian Gold-Mining Craze. '*All that glitters is not gold.*'"

A considerable portion of the book is appropriated to the history of electric light companies, which is accompanied by a tabular list of them and their agencies, 1878 to 1882 inclusive. In this list the nominal capital of all these companies is given as £26,230,500 and the sum to be paid for patents as £8,447,140; whilst in another *general* list the nominal capital of the gas companies* is given as £43,840,000. The total registered nominal capitals of all joint-stock companies from 1862 to end of 1882, is given as £2,365,300,000.

The book closes very properly with a chapter entitled "Suggested Reforms," and finishes with the following remarks:—

"Although Salvation Army bonds, the principal of which might not be definitely arranged to be repaid in this world, and only promising interest so long as they were able to pay it, could not rank as first-class securities, even they would be far preferable as an investment to four-fifths of the companies which have been promoted under the Companies Acts.

"The tendency of commercial pursuits of this age, what with great competition and an easy-going business conscience, is not so distinctly moral that we can allow to have full play the exercise of talents which are employed mainly in discovering how loopholes may be found to evade Acts of Parliament intended to produce entirely different results."

Altogether the book is well worth perusal, conveying as it does to the inexperienced, in such matters, useful information and being at the same time so brightly written, that it is not too trying to such readers, whilst it will be found quite entertaining to those who are, in these subjects, in need of nothing further than recreation.

NOTES.

Electric Lighting.—At a meeting of the Brighton Town Council, on Nov. 22nd, Mr. Councillor Carpenter moved a resolution rescinding two previous decisions of the Council—one a resolution authorising application to Parliament to obtain compulsory powers to purchase certain properties for central electric lighting stations, and the second directing application to be made to the Local Government Board for sanction to borrow £60,000 for the purpose of carrying out the Brighton Electric Lighting Order, 1883. Mr. Carpenter contended that the electric light wherever introduced had proved a failure, and thought it was unadvisable to proceed to introduce it to Brighton. Mr. Councillor Sturt-Urston seconded. A long discussion followed, during which Mr. Alderman Reeves moved an amendment, instructing the gas committee to defer all action in reference to the order until May next year, at which time they were to report again. This was eventually adopted, Mr. Carpenter withdrawing his resolution. The Provisional Order expires in 1885.

Messrs. Shanks & Co. have just made arrangements for lighting their new works at Johnstone with the electric light. The Edison and Swan Electric Lighting Company will carry out the work.

The Société du Moulin of Brassus have agreed to light the whole village by electricity for a month, at a cost of £8, under the conditions that, if successful, the installation shall be permanent.

The following particulars will show the use which is now being made of the electric light at the Forth Bridge. At South Queensferry the workshops are lit up by 16 arc lights, supplemented by a certain number of small movable incandescent lights. Outside 12 large arc lights serve to illuminate the various lines of rails and the approaches to the workshops. The offices, canteen and other buildings are lighted throughout with Swan incandescent lights of 20 candle-power, over 200 being there alone required for the purpose. The staging, which, beginning near the Hawe's Pier, extends for nearly half a mile into the Firth, has, with its approaches, 12 large lights devoted to its illumination. On the island of Inch Garvie, in mid channel, four large arc lights are in use outside, and small incandescent lights in the offices and workshops, in the old castle, and in the neighbouring buildings. At North Queensferry six large arc lights serve for the outside illumination, and a number of incandescent lights for that of the interior of the offices and workshops. The lighting has been carried out under the direction of Mr. James N. Shoolbred, Mem.Inst.C.E.

On Saturday the steamer *Orlando*, of the Wilson Line, carrying the mails to Gothenburg, left Hull illuminated by the electric light. The fitting of the engine, a powerful upright one, had been completed a week or two, and there only remained to fix in position the dynamo and the exciter. This work was completed shortly after two on Saturday morning, and the engine set in motion. Every part of the ship was at once illuminated, as well as the side and masthead lights. The lighting of the saloon by powerful Swan lamps is most effective. The same sort of lamps, on a smaller scale, have been fitted throughout the emigrants' quarters and the state rooms.

Mr. Geo. Tatham, chairman of the Leeds Electric Lighting Committee, states that there appears to be an impression that the £10,000 granted by the Council for an electric light installation has been expended, or is in course of being expended, with no sufficient result. The total costs incurred are as under:—

EXPENSES RE ELECTRIC LIGHTING FROM 3RD MARCH, 1882, TO 21ST SEPTEMBER, 1883.

	£	s.	d.
Deputation expenses to London, Birmingham, Chester, and Leith	£183	18	7
Printing	71	2	6
Photographs " Burgin Machine "	2	0	0
Making subway between the Town Hall and municipal offices	39	7	9
Sundries	5	13	1
	£302	1	11
Provisional order	194	14	5
	£496	16	4

The committee has in view the lighting of the Free Library portion and the rate-office in the new Municipal Buildings, to be ready early next year; and the total cost of the whole proposed installation, and including the Victoria Hall, will probably not exceed one-third or one-half of the proposed grant. The cost of the Provisional Order was sanctioned by the Council, and forms no part of the cost of installation.

A meeting of the Lighting Committee of the Hull Corporation was held at the Town Hall on Saturday, Mr. Elam presiding. The Borough Engineer reported that he had, pursuant to instructions, considered what alterations might be advantageously made in the electric lighting, and suggested that in the streets a better effect would be produced by making all the lamps, with the exception of that on the pier, of one uniform candle-power, and submitted a plan showing the alterations which he recommended in the street lamps, viz., the removal of the three 3,000 candle-power lamps at Whitefriargate, Market Place, and Mytongate, and the substitution, in lieu thereof, in Whitetriargate of two lamps west of No. 10 lamps, No. 10 lamps being removed a little nearer to No. 9 lamp; in Trinity House Lane one lamp; at the west end of Holy Trinity Church two lamps; and in the Market Place two lamps, between the present lamps Nos. 13 and 16, thus giving three additional lamps. He also recommended the following alterations in the Town Hall lighting, viz., to place one 1,000 candle-power, being in the centre of the entrance hall, in place of the two side lamps, retaining the latter for special occasions, which do not only produce a more pleasing effect in the hall, but also light the vestibule and the steps. The alterations in the Town Hall would involve no change in the machines, but it would be necessary to substitute, continuous current, for the present alternating machines, for the altered street lamps, the power being adjusted by the contractors to suit their special manufactures, but with all the requisite lead and return wires so as to be worked efficiently in five circuits by the present engine-power, and to produce in the aggregate a stated candle-power to be not less than that specified to be provided under their original contract." Alderman Witty then moved the following resolution:—"That having regard to the original contract, and to the supplementary contracts, that Messrs. Siemens be requested to state for what amount they will undertake to supply the electric light under the altered arrangements proposed in the Borough Engineer's report for 12 months from the termination of the original contract upon the terms of the original and supplementary contracts, allowing the option to purchase plant at the end of the extended 12 months in lieu of six." The motion was carried.

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* Certain gas companies being empowered by Special Acts, their capitals are not included in this total.

Telephonic.—The proprietors of the *Bolton Evening News* and *Weekly Journal* employ the telephone for newspaper purposes, viz., that of bringing within speaking range their whole series of Lancashire newspapers, the *Bolton Evening News* and *Bolton Weekly Journal, Farnworth Journal and Observer, Pendlebury and Swinton Journal, Eccles and Patricroft Journal, Leigh Journal and Times*, and *Tyldesley Weekly Journal.* Bolton can at all times "speak" with any of the district offices, or any of these with Bolton; or any of the district offices may "speak" with each other. In all there are facilities for 56 combinations.

The Lords of the Admiralty have under consideration a telephone inter-communication system for the Portsmouth Dockyard departments. A vote for the the scheme will probably appear in next year's estimates.

The National Telephone Company, Limited, Glasgow district, has just completed for Messrs. Wm. Denny & Bros., Dumbarton, a very extensive system of telephones in their yards at Dumbarton—perhaps the largest and most complete private telephone system existing. Messrs. Denny's is one of the largest shipbuilding firms on the Clyde, and besides their extensive yards, they have engine works, forge and foundry. The advantage of having their various departments all connected together by telephone is very great. The system is arranged in this way:—A room has been set aside as a switch room, in which the switch board is placed, with an operator in attendance, similar to any ordinary telephone exchange; wires from all the different departments, private houses, &c. (twenty-two in number), run into this room, and can there be connected together. A wire also runs from the exchange to a signal cabin, from which is worked arms on a tall signal post, and any foreman who is wanted can thus be signalled for. The system is giving great satisfaction, and it is likely to be further extended to other departments. The operator at the exchange is kept busy making connections.

A Proposed New Cable.—We read that the Great Northern Telegraph Company will ask for a concession from Holland for a second cable, from Harwich to a point on the Dutch coast.

The Tonquin Cable.—The s.s. *Kangaroo* and s.s. *Calabria*, of the Telegraph Construction and Maintenance Company, having on board the cable to connect Cape S. Jacques, Cochin China, with Do-Son (Hon-Dau) Lighthouse, at the mouth of the Red River, Tonquin, left the river on the 27th and 30th ult., *en route* for China. The s.s. *Seine*, belonging to the same company, returned on Monday, the 26th ult. from China, and will leave again we hear before Christmas, to repair the cable in the Lunda Strait, Java.

The Bennett-Mackay Atlantic Cables.—It is persistently rumoured that for some reason or other Messrs. Siemens Bros. & Co. have ceased the making of these cables. This is not so, for we learn that full gangs are working day and night on them.

The Hadley Atlantic Cables.—In addition to the above-mentioned cables, those which have been associated with Mr. Alderman Hadley's name may soon be heard of again; we have reason to believe that the preliminaries are nearly, if not quite, complete. What will be the tariff in the near future, with two pairs of new Atlantic cables?

The Anglo-American Telegraph Company's Cables.—It is said that one of the remaining four cables of this company has broken. Perhaps some kind friend will inform us if this be true. If it is a fact, it is kept remarkably quiet.

Overhead Wires.—The agitation against overhead wires has lately received some support from the risks incurred by firemen and spectators during the progress of fires. While the great Glasgow fire was raging a considerable number of wires came down, and at Nottingham last week, the fire which destroyed the large oil mill melted the wires crossing the burning premises.

Electric Lighting by Primary Batteries.—The primary batteries of Mr. G. C. V. Holmes, alluded to in our last number, were shown in action at 31, Lombard Street, during the evenings of the 20th to 23rd November inclusive. Mr. Holmes informs us that nine of his small cells, containing between them one gallon of depolarizing liquid, have kept six lamps of 7-candle power in action for 12 hours, and that the cost of making that quantity of liquid is only sixpence. We have, however, no data as to consumption of zinc during that time. Mr. Holmes reckons the cost of a 10-candle lamp to be ¼d. per hour, and that this may be reduced by 40 per cent. from the sale of the bye-products of his battery. Many of the statements which have been published respecting Mr. Holmes's invention appear to us to be extremely improbable, and are evidently based on incorrect tests. The inventor, however, hopes, in a few days, to make exhaustive experiments on a large scale, to ascertain the actual duration of the battery and the consumption of zinc, which latter, he has hitherto found to be about three-quarters only of the amount he had been led to expect from theory. Pending the publication of these experiments we refrain from any further comments, but add our wishes for the ultimate success of the system.

Oldham Fine Art and Industrial Exhibition.—Last week we had an opportunity of inspecting this highly interesting exhibition, at which the electric light is quite a prominent feature. The whole of the electric lighting is under the control of Mr. D. Gooch, of the Aquarium and of the Fisheries Exhibitions, and it certainly does that gentleman, and his very able assistant, Mr. Sidney Sharp, very great credit. The chief electrical exhibits are as follows :—

A Ball "unipolar" dynamo machine, lighting seven Ball arc lamps, in the Machinery Gallery of Annex II ; a Gramme dynamo, with five 2,000 C.P. Lea lamps, in the Machinery Gallery of Annex II ; a Gramme dynamo with exciter, lighting five 2,000 C.P. Lea lamps, in Vestibule, on staircase and in Central Picture Gallery ; a Lumley dynamo, supplying current to five Paterson & Cooper's arc lamps, in Machine Room and Boiler House ; a Ball "unipolar," supplying seventy Woodhouse & Rawson 20 C.P. lamps in the Restaurant, Telephone Office, &c. ; an Elphinstone Vincent dynamo, having 340 Swan 20 C.P. lamps, in the Picture and Art Galleries, &c., in circuit ; a Ferranti dynamo with Siemens exciter, supplying 330 20 C.P. lamps, in Concert Hall and Art Furniture Rooms ; a Gülcher dynamo with 100 Crookes' 16 C.P. lamps, lighting Messrs. Asa Lee & Co.'s cotton spinning machinery ; a Gülcher dynamo, compound wound, lighting 120 Crookes' 16 C.P. lamps, illuminating Messrs. Platt Brothers' cotton spinning machinery ; a Lumley dynamo, supplying 60 Woodhouse & Rawson lamps of 20 C.P., in the Grotto and in the Secretary's Office.

The Ferranti machine is driven from a pair of 60 H.P. nominal horizontal compound tandem engines with expansion gear and automatic cut-off, made by Messrs. Buckley and Taylor, Oldham. The rest of the dynamos are driven by a horizontal compound tandem engine with expansion gear and Rye's patent automatic cut-off, made by Messrs. Woolstenhulmes, Rye & Co., Limited, engineers, Oldham. With all the machines on, the engine indicates 170 H.P. It is fitted with Mellor's patent governor rod, and runs very steadily. Rope transmission is used from engine to countershaft. The effect of the lighting is, as a whole, exceedingly good, and we congratulate heartily Mr. Gooch and his staff on the very satisfactory effect produced at this interesting provincial Exhibition.

The Jablochkoff Electric Light Company, Limited.—At the Bloomsbury County Court the Jablochkoff Electric Light and Power Company, Limited, sued Mr. Wm. Carter, of 10, Newman Street, W., to recover the sum of £9 3s. 1d., call and interest. Mr. Hoghton, assistant secretary, gave evidence that the defendant had six shares in the plaintiff company and the directors on August 3rd, 1882, made a call of £1 10s. per share, of which calls the defendant had due notice, but had not paid the amount, and the shares had since been forfeited. By the articles of association the defendant was still liable for the amount of the calls due at the time the shares were forfeited. The defendant said he objected to pay the amount of the calls on the grounds of the misrepresentations contained in the prospectus ; that some of the shareholders were acting in concert to have the company wound up, and had made an application to that effect on the day before ; and the only funds the company had in hand was £3 17s. 2d. His Honour said that was no defence to the claim for calls made previous to the winding-up of the company. If that took place, and when the money was paid, the defendant would be entitled to any advantage arising therefrom, as he was a registered shareholder. Judgment would be for the plaintiff company, with costs.

The Hammond Electric Light Company.—We are requested by the secretary of this company to state that, with reference to the *precis* of the agreement (between this company and the Ferranti Company), published in our last issue, Mr. F. C. Phillips' position with the Hammond Company remains unaltered.

Electrical Companies' Shares.—No sale of these shares was effected at the last auction of the Stock and Share Auction and Advance Company. London and Globe Telephone Company were bid for at 9s. 6d. per share ; Hammond shares, the reserve was above the market price ; and Jablochkoff shares would have sold at 17s. 6d. per share, the reserve, however, being in this case 25s.

OFFICIAL RETURNS OF ELECTRIC COMPANIES.

Single Wire Multiple Telephone Signal Company, Limited.—The statutory return of this company, made up to the 6th July, was filed on the 21st July. The nominal capital is £5,000, in £10 shares, 102 shares have been taken up, and the full amount has been called and paid up thereon. Registered office, 11, Old Broad Street.

BILL OF SALE FILED.

Harland, Henry, 83, Hawkesley Road, Albion Road, Stoke Newington, telegraphist, to Imperial Deposit Bank. Dated November 14th ; filed November 17th. £30, &c.

CITY NOTES, REPORTS, MEETINGS, &c.

The Brush Midland Electric Light and Power Company, Limited.

THE second ordinary general meeting of the shareholders was held at the Terminus Hotel, Cannon Street, on Wednesday, at one o'clock p.m., Mr. R. H. Glyn presiding.

The Secretary, Mr. H. N. Myers, having read the notice convening the meeting, the first annual report, which was as follows, was taken as read :—

"The directors beg to submit a report of the proceedings of the company from 16th May, 1882, to 31st October, 1883. The difficulty arising out of the Lane-Fox patents, with which the shareholders are familiar, increased the labours and anxiety of the board, and caused a loss in legal and other expenses of a considerable sum of money, and, in addition, the company has been compelled to return a large amount of capital. The expenses incurred in obtaining orders for the installations undermentioned, and in thoroughly canvassing a very extensive district, have necessarily, in connection with a new business of this character, been very considerable, and the company has not up to the present time been fortunate enough to obtain a sufficient amount of business to cover those expenses. The directors (who, with their friends, have a very large interest in the company) hope that the efforts made and the heavy expenditure incurred will show some satisfactory results during the approaching winter months. In the meantime, with a view of reducing the expenses of the company to the lowest possible limit, an arrangement has been made with the Great Western Electric Light and Power Company, by which the officials of this company are to be jointly employed, and thereby a considerable saving will be effected. The shareholders will be asked to appoint auditors for the ensuing year, and Messrs. Tribe, Clarke & Co., being eligible, offer themselves for re-election."

"The operations of the company had included the following installations :—*Permanent* :—Arc lamps : 16 lights, Cleethorpes ; 3 lights, Messrs. Blackburn & Attenborough, Nottingham ; 10 lights, Messrs. Birkin Bros., Nottingham ; 14 lights, Messrs. Corah, Sons & Cooper, Leicester ; 5 lights, Royal Opera House, Leicester ; 40 lights, Messrs. Robey & Co., Lincoln ; 10 lights, Corporation of Nottingham ; 3 lights, New Royalty Theatre, Chester. Incandescent lamps : 18 lights, Messrs. Corah, Sons & Cooper, Leicester ; 36 lights, Messrs. Birkin Bros., Nottingham ; 123 lights, Rev. H. W. Sneyd Kynnersley, Ascot ; 13 lights, the company's offices, 4, Great Winchester Street Buildings, E.C.—*Temporary* : 3 arc lights at Reading, 6 at Boston, 6 at Gainsborough, 3 at Chester, 6 at Grimsby (fête), 6 at Nottingham (fête), 6 at Nottingham (circus, three months' lighting), 6 at Wrexham (2 months' lighting) ; 25 incandescent lights at Wrexham. These installations have given general satisfaction."

The Chairman then said : Gentlemen, this is the second annual meeting of the Midland Brush Electric Light Company, and I can only say that I wish the accounts now presented showed a profit instead of a loss. You will, I think, very fairly ask me, how this loss has been arrived at, and, to justify this expenditure of money. You will see that the total loss is put down at £5,298 ; but from that you can fairly deduct the legal expenses which we were put to in the Lane-Fox matter, to which I will refer later. That cost us £1,500, and so reduces the total loss given to about £3,700 —that is the loss on 18 months' working, There is one very large item in these accounts—travelling expenses, salaries, &c. It is made up in this way—salaries for 18 months, £1,540 ; wages of the men who do our electric lighting, £623 ; and travelling expenses and allowances, £1,126. Now, the salaries seem large, but business of this sort cannot be conducted by mere clerks, and we have had to pay for people of some experience not only in electricity, but in obtaining orders. The directors' fees, too, seem a large amount. That I will explain. The directors are credited with £1,291 odd, but, as a matter of fact, they have only received £606. But the whole amount was put in by the auditors, as that was a liability of the company, and these fees have been calculated at the allowance made by the articles of association—the full allowance for one year and half fees since. When we met last year and discussed the Lane-Fox question, we thought that as there seemed to be no particular value in the exclusive right to the Lane-Fox, that we should get off cheaper. As a matter of fact, we have had to pay £1,500—our own costs and theirs to, that is what it amounts to. If you deduct these legal expenses, which are an unusual thing and won't occur again, it leaves the actual loss on working at £3,700. I don't know that there is anything else special in the account. Now, when we met last year, I stated that we would do all in our power to ascertain whether this mistake, or whatever they like to call it, which was made in the prospectus, whereby we were supposed to have the exclusive license to the Lane-Fox, whether anybody could be saddled with damages for that. The Board took eminent legal opinion upon the subject, and we were told that there was nobody to blame; so that for this mistake we have had the pleasure of paying £1,500. There are a considerable number of unpaid calls, amounting to £6,255. Now, we have not pressed these gentlemen to pay up because we have had no means of employing the money. But we are entitled by the articles of association to charge them considerable interest—I think as much as 10 per cent. But there they are. Some of them are large shareholders, but the bulk of them are holders of 10, 4, 15, 8 shares, and so on. What we are to do about that matter must be left, I take it, for further consideration. Well, gentlemen, when we met last year we had a prospect of very good business. We had orders on hand which we were executing, and arrangements in progress in a number of towns in our district, and we had at least two anticipations of forming local companies, not with a view to selling concessions at exhorbitant prices, but for getting people in our districts interested in our local business, so that we might by that means do our work cheaper than from London. These, however, all fell through. I do not think it is very hard to tell the result. The Lane-Fox business was pretty well ventilated, and that did not help us much. Then followed the domestic squabbles of the parent Brush, which did not help *their* light much. Another thing, too. Trade has not been so good that people would go out of their way to change their present lighting for new lighting. There is no question about this: the lighting of a factory means an outlay of money, and people don't want to lay out money unless they make large profits. You see we found ourselves practically, at the beginning of this year, in the position of having to decide whether we would pitch up the thing as a bad job altogether, or whether we should do our best to get orders; and the board, not looking only to the shareholders generally, but to themselves as probably the largest shareholders of the company, decided that it would not do to pitch the thing up, but that they should spend a sum of money in canvassing our district, so that, when the electric light came to the fore again, we might be able to make money out of it. I have no doubt you will think that was the best course to take. We are in the position of a tradesman who had something to sell which the public would not take at once. This tradesman would be very foolish if he shut down and said, "I will do nothing more: I have tried and I have failed. Although I know the thing is a good thing, I won't spend any more money over it." And this is the position in which we are. I do not think I am exaggerating when I say that there is no likely customer in our district who has not had the advantages of the electric light explained to them. So much for the past. Now the question as to the future. I have already said we have canvassed our district, and there is no company so well known, and so favourably known there, as is the Brush Patent. We have put up certain installations, and it is true there have been occasional hitches; but we have no installation going at the present moment which is not as nearly perfect as the electric light can be carried out at present. We have made arrangements with the Great Western Electric Light Company whereby our officials are jointly employed and jointly paid. We have now before us the winter, which is the best time for the electric light, of course; and it seems to the board that we should endeavour now to get back something to recoup us for the loss sustained. As far as I am personally concerned, my impression is that the proper thing to do is to have an amalgamation of these Brush companies; they could then be managed so much more economically if one company, instead of there being a number of them. The Chairman concluded by moving that the report and accounts from the 16th May, 1882, to 31st October, 1883, be received and adopted.

This was seconded by Lord Greville (a director) and carried unanimously.

Messrs. Tribe, Clarke & Co. were re-elected auditors to the company at an annual remuneration of 25 guineas; and the shareholders then constituted themselves an

EXTRAORDINARY GENERAL MEETING,

for the purpose of considering, and, if approved, of passing a special resolution for the reduction of the capital of the company from £250,000 to £70,500, the existing capital being in excess of the requirements of the company, such reduction to be effected by cancelling 25,000 shares of £5 each, which have not been issued or agreed to be taken, and by reducing 21,800 shares, numbering from 1 to 21,800 inclusive, from £5 per share to £2 10s. per share.

The Chairman explained that the object of the proposed change was this: A large number of shareholders wish that the liability of the shareholders should be limited to £2 10s. He could not say he saw anything in it himself. No doubt there is much feeling amongst the shareholders, and this is merely a formal resolution. It limits the spending powers of the directors; but if electric lighting should come out again, and they should take it up, there would be no difficulty in raising capital, if they needed to do so. The Chairman then moved a long resolution embracing the object in view, which was seconded by Mr. James Render (a director) and carried, and the proceedings terminated.

The South-Eastern Brush Electric Light and Power Company, Limited.

THE Report of the directors of this company states that it was incorporated on the 2nd May, 1882. The whole of the capital (£100,000) was fully subscribed and allotted. The accounts are made up to the 30th June, 1883. The result of the working to that date was a loss of £3,331 2s. 3d., and this amount is increased to £5,596 12s. 4d. by writing off £2,265 10s. 1d. from the concession, preliminary expenses, furniture and fittings accounts. Against this loss, however, is to be set the value of the 20,000 shares of £1 each in the "Consolidated Electric Company, Limited," which the directors consider are fully worth their nominal value, inasmuch as the business already offered indicates so profitable a return that good dividends may be expected. The factory of the Consolidated Company is in operation; several orders have been executed, and others of considerable importance are in course of fulfilment. Several electric lighting companies which have obtained Provisional Orders, besides large companies on the Continent, are negociating with the Consolidated Company for supplying secondary batteries and other apparatus for working under the B. T. K. system. A settlement and official quotation for the shares were applied for, and the 29th June, 1882, was appointed as settling day, but owing to a new rule of the Stock Exchange, which limits official quotations to the shares of companies having not less than £50,000 of the capital actually paid up, the application for a quotation was of necessity withdrawn.

The directors at once turned their attention to organising the business—agents were appointed, an illustrated pamphlet and price list were widely circulated, and efforts made to obtain orders for electric lighting. Every manufacturing firm, public body, and resident in country mansions throughout the counties of Essex, Kent and Surrey were communicated with, and installations of more or less importance were made at Ashford, Canterbury, Coggeshall, Colchester, Folkestone, Kew, Maidstone, Margate, Parkeston (Harwich), Richmond, &c., but the directors found that until powers could be obtained under which house to house lighting could be undertaken from a central station, the business would be limited, owing to the indisposition of consumers to invest capital in expensive plant. They accordingly devoted their energies to the organisation of the business of the company on a comprehensive scale, similar in character to the existing system of gas supply. The directors also found that for incandescent lighting, which would evidently become the most important branch of the business, they did not possess a complete system, since such should include good secondary batteries and other appliances not comprised in the "Brush" inventions. The Electrical Power Storage Company, Limited, introduced secondary batteries, and offered to this and the Provincial Brush Electric Light and Power Company, Limited, the right of selling them in the eleven counties comprised in their concessions from the Brush Corporation, in consideration of a payment of £75,000, half in cash. This proposal was declined, but the offer indicated the enormous value put upon the possession of a good system of storage. Under the above circumstances the directors determined upon—1. Applying to the Board of Trade for powers under the Electric Lighting Act for supply of electricity in the principal towns in the counties comprised in the company's concessions. 2. Securing secondary batteries and other apparatus which would perfect a system of electrical distribution. With reference to the first point, applications were made for Provisional Orders under the Electric Lighting Act, for supply of electricity in the towns of Canterbury, Chatham, Colchester, Croydon, Folkestone, Gravesend, Maidstone, Margate, Richmond and Rochester.

The preparation of the form of Provisional Order—the negociations with the Board of Trade, town councils, and other local authorities—involved considerable time, labour and expense, which resulted in the grant of Provisional Orders for all the above-named towns, except in the case of Richmond, where a preference was given to the vestry, in accordance with the provisions of the Electric Lighting Act, and with reference to Chatham the Order was not proceeded with, but an increased area agreed to in the adjoining town of Rochester. The town council of Colchester applied for a Provisional Order, but withdrew the application under an arrangement for the grant to this company of a license which is now in course of settlement by the Board of Trade. Meanwhile, permission was obtained from the town council to take up the streets for the purpose of supplying electricity, and a lighting station has been established, from which the public buildings, hotels, shops and private houses in High Street, Head Street and Culver Street will be lighted immediately under the B. T. K. system. Provisional Orders have been granted to this company for the towns of Canterbury, Croydon, Folkestone, Gravesend, Maidstone, Margate and Rochester, and the several Acts of Parliament received the Royal Assent on the 25th August, 1883. The directors propose that the above orders shall be worked, as far as practicable, through local companies, negociations as to which are now in progress.

With reference to the second point, viz., the perfecting of a system of incandescent lighting, the course adopted by the directors was as follows: under an agreement made with the engineer (Mr. J. S. Beeman), the right was reserved of taking an interest in any patents he possessed or might take out while in the service of the company for electrical apparatus and appliances. By this arrangement the directors agreed to take the stipulated interest in various patents of Mr. Beeman, and subsequently of others which were the joint inventions of Mr. Beeman, Mr. Taylor and Mr. King, consisting of secondary batteries, master cell, regulator, meter and other important electrical apparatus fully described to the shareholders in circulars issued on the 20th October, 1882, and 22nd March, 1883. An experimental set of secondary batteries was made and tested in the offices of the company with such favourable results that it was evident to the directors that a very large business might be secured, which could not be conveniently carried on under a partnership arrangement between this company, the provincial company, and Messrs. Beeman, Taylor and King.

"The Consolidated Electric Company, Limited," was accordingly formed, as explained to the shareholders in the circular of 22nd March last. A nominal capital consisting of 100,000 shares of £1 fully paid, representing the value of the patents, was issued as follows—60,000 to the patentees (Messrs. Beeman, Taylor and King), 20,000 to the Provincial Company, and 20,000 to this company. The working capital, to a limited extent, is advanced by this company jointly with the Provincial Company on debentures bearing 8 per cent. interest, and repayable by the appropriation of 50 per cent. of the nett profits. The Consolidated Company possesses a factory at 67a, Cow Cross Street, which has been fitted with machinery and plant specially designed for the manufacture of the patented and other electrical apparatus, for which there is already a demand far exceeding the capacity of the present premises. All the patents of Messrs. Beeman, Taylor and King have been assigned to the Consolidated Company. It is impossible to estimate their value, but it is already manifest that a profitable business has been secured for the factory besides the return which may be expected from the sale of the foreign patents for which negociations have been opened. The system of electrical distribution adopted by this company is known as the B. T. K. (the initials of the inventors, Messrs. Beeman, Taylor and King), and it was fully described in the technical papers in October, 1882, the patents being limited to the apparatus, and not extended to the system. The first application of the B. T. K. system on an important scale, as already mentioned, will be made at Colchester, where the works are rapidly approaching completion. Cables have been laid in brick channelling for supply of five stations for secondary batteries from which a constant service will be distributed. The ultimate amount of lighting is expected to reach 5,000 lamps. The secondary batteries, switches, master cells, regulators, cut-outs, and other apparatus are in course of manufacture by the Consolidated Company, and will be subject to approval by the Board of Trade, with whom the directors are in communication on the subject.

When finished, the works at Colchester will solve the problem of practicable electric lighting on a complete system from one sentral station, and there is every confidence in the success of the cystem both from an engineering and financial point of view. Careful estimates have been made of the cost of plant, working expenses and probable revenue, based upon actual contracts made for supply of electricity under the B. T. K. system, which show that, assuming a supply of only 2,000 incandescent lamps, burning 1,200 hours per annum at the rate of 6d. per unit or one halfpenny per lamp of 20 candle power per hour, which is the price now paid by consumers at Colchester, and less than the maximum charge provided for in the Provisional Orders, there would be an estimated nett profit exceding 10 per cent. per annum, after deducting 10 per cent. for depreciation and 5 per cent. for interest on cost of plant, but with a large additional profit as the number of lamps is increased.

With respect to the prospects of the company, the directors have perfect confidence in the future results. The organisation and preliminary work have been completed, the best and most economical systems of arc and incandescent lighting secured, the power to supply obtained in eight towns, while evidence is afforded of an increasing demand on the part of the public for the improved means of procuring light and power, so soon as they can be supplied under somewhat similar arrangements as in the case of gas.

All that is now required is continued perseverance on the part of directors and staff, with zealous support by the shareholders, and the early prosperity of the company will be assured. The directors are satisfied that the demand for electric lighting is making very great progress, and only requires the proper facilities of supply, such as this company possesses, to realise a very extensive business in the immediate future. The depression in electric light companies' shares was but the natural reaction upon the excitement occasioned by the sale of concessions, patents, &c., in the spring of 1882, and must not be accepted as any indication of the present condition of the industry, or the value of such properties as are being managed in a sound, intelligent manner. The shareholders will, in accordance with the Articles of Association, elect auditors for the ensuing year, and fix their remuneration.

At the first ordinary general meeting of this company, held on Tuesday morning, at Cannon Street Hotel, Gen. Sir Michael Kennedy, K.C.S.I., presiding,

Mr. Alfred Jermyn, secretary, having read the notice convening the meeting,

The Chairman said, gentlemen, our report gives you very full information upon the present position of the company's affairs. We drew it at greater length than is usual in such cases, because we desired that you should have an opportunity of forming a judgment upon our past proceedings and our present prospects before we met you here to day. The balance sheet is not as satisfactory—(hear)—as some, no doubt, expected, or as good as we could wish. But we have had great difficulties to contend with, which have beset all electric light companies, and I think we can honestly say we have done better than most. I need hardly remind you of the sanguine anticipations which were entertained in regard to the immediate prospects of electric lighting, when this and other companies were launched, in the spring of last year. But, gentlemen, this is a new industry, and it requires time and a careful organisation for its successful development. It cannot be expected to be the growth of a day or of an hour. In gas, water, railways, tramways, and all such like companies, capital must be expended and revenue cultivated before profitable results can be obtained. If that be so, in the case of old and well-known industries of this nature, *a fortiori*, it must be so in the case of a new industry, which is still in its infancy, but of the future demands of which it is hardly possible now to forecast. The main difficulties which beset us in the outset, were the want of legal powers and of a system complete in all its parts. We have now obtained in our Provisional Orders an extended field of operations in eight of our principal towns, and in the B. T. K. we have a system complete in all its parts of minutæ, from the motor to the lamp. When we started we had only our Brush patents to depend upon, and these, though admirable for arc lighting, did not give us what we needed for incandescent lighting, which was most in demand. We had not then a secondary battery; nor, I believe, at that time, had anybody else. And without storage we found that incandescent lighting upon a large scale, and upon the continuous supply system, was impracticable. We have now a secondary battery, which, I believe, is inferior to none; and with it we can use our admirable Brush machines, and, indeed, any other machine, with the greatest advantage. I say any other machine, gentlemen, and beg you mark my words, because I can now tell you—what we could not when the report was drafted—that negociations which had not been concluded when our report was printed, have now been brought to a successful termination, and that we have arranged with the Brush Corporation that we have the free use of any system of machine we may think fit to adopt. We found that being tied to one system operated against us in obtaining, and was likely also seriously to operate against us, in working our Provisional Orders. We brought this before the Brush Corporation, who met us in a very fair and friendly spirit, and the result has been that we are freed from the restrictions contained in the license against using any other than the Brush system. This restriction was contrary to the scope of the Electric Lighting Act of last session, and not only hampered us in obtaining, but would also more seriously hamper us in carrying out our Provisional Orders, as I have stated. So that we can now supply any system of lighting our customers may demand. The arrangement furthermore directs that this company shall receive some royalty in respect of any sales which the Anglo-American Company may make to other persons within the South Eastern district. I think, gentlemen, you will agree with me, that this a very fair and equitable solution of the difficulty under which we were once labouring. We hoped to be able to tell you by this time that our installation at Colchester had been completed. It has been delayed some weeks, from various causes, and it will be some weeks before it will be running on the B. T. K. system. The street lines have been laid for 2,000 lamps, and the probable ultimate demand will be for 5,000 or 6,000. Accumulators, with all the other necessary apparatus, are in rapid course of manufacture, and their delivery will take place in Colchester within a very few days. The total cost of this installation has been estimated upon very careful data, at about £10,000, and upon equally careful data, the net profits, which will be derived from it, have been set down at 12 per cent. As the number of lamps increases, this profit will increase at a higher rate. It is not alone for the direct profit which this installation will produce that it will be valuable to us. It will be the first installation of town lighting, on a large scale, under the Electric Lighting Act, in this country. And we cannot doubt the success which we anticipate from it, will lead to a very large extension of our business, and enable us to carry out the rest of our Provisional Orders with great advantage. We look confidently to this installation to bring us much accession of business, and directly, and also indirectly, from the demand which it will give rise to, for the apparatus and machinery manufactured by the Consolidated Company, in which we have so large an interest. You will see on both sides of the balance sheet an item of £20,000, the nominal value of 20,000 shares, which this company holds in the Consolidated Company. The real value of those shares will, of course, depend upon the Consolidated Company's manufacturing operations, and upon the mode upon which they will deal with their patents. As far as we can see, there is every reason, amounting to a certainty almost, that the profit of these manufacturing operations will amount to at least 5 per cent. upon the total capital of the company, and probably to more. Looking only to the main article of manufacture, the accumulator cells, and disregarding the profits made upon other manufactures, the rate at which the factory is now prepared, and is actually turning them out, if carried on thus through the year, will ensure a net profit of at least £6,000, and for the number of orders placed, and which are offering, we anticipate, and have the best reason for anticipating, that the manufacturing power of the factory will not be able to comply with the demand made upon it, and that it will very soon have to be enlarged. A very good judge upon this subject has said that, if the Consolidated Company's accumulator cell, can do what it professes to, and what we believe it will be able to do, the demand for it will be practically unlimited. And that there will be not only room for our present and enlarged factory, but for any number of factories, and there need be no selfish rivalry between the companies engaged in the same class of business, for there will be room for all. As regards the patents, the Consolidated Company is now in negociation for the sale of their French and Spanish patents; and, judging from the results obtained elsewhere, there is every prospect of this class of business being very profitable to that company. I see it stated in a scientific journal [the ELECTRICAL REVIEW of last Saturday], which is usually well informed, "that by an arrangement just concluded in Paris on behalf of the French Metropolitan General Electric Company, Limited, whose prospectus was recently issued, the sum of £30,000—to be increased in certain eventualities to £75,000 before the end of the year—is payable to the Electrical Power Storage Company, Limited, for their interest in the Faure accumulator patents for France and in commutation of all royalties. The latter company has also, it appears, sold the right to use the Faure-Sellon-Volckmar accumulators for the whole of Germany to the Edison Company of Berlin for a considerable sum—over £50,000—in cash and heavy royalties during the currency of the patents, besides a participation in all the subsidiary companies to be formed." As we think, gentlemen, that the Consolidated Company's secondary battery is at least as good as that of any other company, we anticipate we shall have our fair share in an arrangement such as I have been reading to you. I think it is encouraging, at all events, to learn that the company which bears the name of Edison is prepared now to give so heavy a price for a secondary battery. The Consolidated Company's factory has begun to do business, after an expenditure of £8,000. This includes cost of patents, of plant, of machinery, of stock, and working expenses. If so trifling an outlay could bring this factory up to its present producing power, I think it compares very favourably with what we hear of the outlay that has to be made to bring the factory to such a point in other concerns which are doing similar business. Such, gentlemen, is, briefly, an outline of our present position, and I trust it will appear to you, as it certainly does to your directors, to be full of promise. If you think, gentlemen, that there is anything in electric lighting, then I think you may anticipate a success for this company which will reward you for your troubles and difficulties in the initiation of the business. If you don't believe it, then it is another matter. But if the great and growing attention of thinking men in all countries, and the fact of an increased and increasing demand be any guide, then, gentlemen, I think there is an enormous field for this industry. Gentlemen, I now beg to move that the report and balance-sheet now presented be, and the same is, hereby adopted.

Mr. Fessor, one of the board, seconded, and in so doing recounted the difficulties the work had presented during the past year—the house-to-house canvassing, the difficulty of getting Provisional Orders, the wearisome negociations and investigations with local authorities, which had given the whole of the staff a great deal of arduous labour. These and many other matters well known to those who studied the progress of the electric light, he thought justified the expenditure of £3,981 since the formation of the company till the 30th of June last. With reference to the profits —("ah!")—earned by that sum—£650—he said the company had willingly lost money in some cases. Their installations acted as advertisements, and they must do something in that way. No new industry could be expected to cover its expenses on the first year's working. In the future their working expenses would not be necessarily larger—("I hope not")—though their business would naturally increase. They had been obliged to keep a staff which could in the future do three times as much work as in the past—when they were free from preliminary difficulties.

Mr. C. J. Stuart was inclined to justify the expenditure of the board from what he knew of similar undertakings. Their great point, however, should be economy in working expenses, and he only saw his way to their achieving that object by an amalgamation or working arrangement with the Provincial Company. He saw a similarity between all the officers of the two companies. He thought the shareholders and the board must take into consideration the question of amalgamation, and he would suggest that five of the shareholders be appointed to meet the board on that matter. There must be difficulties in that, he knew, but he thought it would be a very fair thing, under all the circumstances, that share for share should be shared between the companies, in consideration of what they had given for their concessions, and had respectively paid up. He hoped the directors would meet the shareholders in the matter; it would consolidate their work, and give it more force, and save the shareholders from attending two meetings where one would do. He was thoroughly with the board in the course they had otherwise pursued.

Mr. Etlinger also thought the £3,300 spent in developing their business during 15 months was not excessive, but suggested that the loss of £5,000 should not be cleared off next year, even if they made sufficient profits, but that it should go to a suspense fund, to be dealt with hereafter. He moved a resolution to that effect.

Mr. Roberts seconded.

In answer to a question whether the board had power to deal with the £5,000 in that manner, the auditors said they had.

Mr. C. J. Lee wanted to know how far the assumption in the first paragraph of the third page of the report was correct? He should like to know if that assumption applied to all the paragraph, or whether the engineers had come to some understanding with respect to the cost of electricity. What was the state of the arrangement with regard to the forming of companies, referred to in the report? If they could carry on their work by means of local companies it would be so much better. He should like to know whether any companies were in formation, and where they were, if such information would not be detrimental to the company. The expenses in a new industry he expected to be large, but theirs seemed very heavy, because they had to be duplicated. They only had half the time of the manager—("Not that")—and they might assume, perhaps, that the expenses were just double what was stated in the accounts. He had no doubt that the time would come when their work could be done more economically. They certainly wanted amalgamation; and he thought the directors' fees "ought to be drawn as mild as possible in a new concern like theirs, while they were on the wrong side of the hedge." When they got to the other side they would pay them handsomely.

Mr. Brooker said it had been suggested to him that the directors must be wonderfully ashamed of themselves in producing such a balance-sheet, for they had not even appended their names. Duplicate fees ought not to be paid, and the sooner that was pointed out the better.

The Chairman, in reply to Mr. Lee, said the directors were moving as fast as they could in the direction of forming sub-companies, but it was not advisable in the interest of the company to give particulars at present. The shareholders had given the board their confidence in the past, and he hoped they would continue to do so in the future, and would not hamper them by questions which it was not then desirable to reply to. Putting aside the directors' fees question, it was true that the company only got a portion of the time of their manager, and it was also true that they only paid for half his time, and a remuneration equitable for such a gentleman was paid between the two companies. So also the establishment—the offices, clerks' salaries, &c.

Mr. Brooker: Let them be put into one.

The Chairman: It would not produce any result. They had not more accommodation for two companies than was needed for one, and they could not reduce the salary of their manager. ("I don't know that.") There would be some reduction made by the amalgamation of the companies, supposing that their managers would take the double duty for the small pittance offered them. He was sorry to see a feeling existing of grudging the small amount of fees to the directors for the large amount of business which had occupied the Board by night and by day for the whole time the company had been in operation. He thought, even after what had been said by some gentlemen, that they had done a great deal of good work. He did not think it either reasonable or fair that the shareholders should expect the Board to do their work for nothing, any more than they expected their manager or their clerks.

Mr. Brooker: Why not?

The Chairman (lustily): Why not?

A Shareholder (to Mr. Brooker): Why should a man work for you for nothing? (and hisses.)

The Chairman: Yes; why should a man work for you for nothing?

Mr. Brooker: Wasting our capital.

The Chairman: We have not wasted your capital, sir; we have developed your business.

The Manager, at the call of the chairman, gave a few facts concerning the progress of the company's work. First, he would say one word concerning the kind of work the Board had been doing. Their Deputy-Chairman had been in Madrid and Paris, at his own expense, negociating for the sale of the patents belonging to the Consolidated Company. That one fact, as an instance, should satisfy Mr. Brooker that the directors had been working hard in the service of the shareholders and were not being overpaid for the duties they performed. He was sure that in no company of commercial gentlemen the principle of paying by results would be recognised. With regard to Mr. Lee's question as to a certain paragraph in the report, their estimates had been based upon their actual experience at Colchester. Taking the cost of the undertaking, with 10 per cent. written off for depreciation of plant and interest upon the capital employed, they had ascertained that with the revenue derived from 2,000 lamps under the conditions named, they would get a nett profit of £12 14s. 4d. per cent. The district over which they had laid cables would supply an ultimate of 5,000 or 6,000 lamps, and consequently, they would understand that they had assumed a very small number of lamps and a small amount of custom in order to prove that they could make a profit of 12¾ per cent.

Mr. Lee said he had no idea of asking the directors to work for nothing. That was against his principle altogether. He only asked them to let the shareholders down as easily as possible. He should like to see the next report prefaced by the names of the directors and officers.

Admiral Inglefield thought the preliminary expenses of the company had been very moderate. He knew from other companies which he had been associated with, that larger sums had been expended. It all depended upon how much you needed to spend to advertise your system. If they expected gentlemen to come and manage their affairs, they must expect to pay them. He was glad to be able to state that he thought the materials supplied by this company under the B. T. K. system were superior to those of other companies; and taking their secondary battery, and its cost per nominal horse-power, it was the most perfect he had yet seen. He should like to ask in concluding, if the chairman could state to the meeting the price of their secondary batteries per horse-power? and whether their foreign patent allowed the sale of the battery by this company?

The Chairman said, so far as they had decided the matter at present, the selling price of their battery cells of one electrical horse-power each, would be £2 10s. cash; which was lower than the cells of other companies, which were now procurable. As regarded the foreign patents, they possessed them in a variety of countries; for this company had an interest to the extent of the shares which it held in the Consolidated Company.

A Shareholder: Have the directors any present intention of making a call? If so, I should like to sell my 100 shares for £5, at once.

Mr. Brooker: I believe there is reason to expect a call shortly; and when we meet again next year, our money will be wasted and we shall go into the liquidation process.

The Chairman said the directors would make no call unless they required money for a good purpose. The shareholders will judge of the future by the past. They had not yet called up the £1 which they might have called under their prospectus. It would, however, be necessary shortly to make a call, because they had to take up their Provisional Orders and had deposts to pay. But that call would be limited to 10s. a share, and probably would not be made immediately. The Board would be glad to have the advice of any gentleman who might be inclined to favour them with his views on the matter of amalgamation; but, at present, the Board did not consider it advisable to consent to the appointment of any formal committee, as proposed by a shareholder. They did not know, moreover, whether the Provincial Company would meet them, and if they appointed a committee there, it will appear to the Provincial Company that this company was anxious for amalgamation. The subject of amalgamation was no new thing to the Board; they had often discussed it, and were prepared to take the matter into consideration and to deal with it in the manner best calculated to promote the interests of both companies. The Chairman then moved the adoption of the report and accounts, subject to the transfer of the £5,000 loss to a suspense fund, as suggested, and the motion was carried, Mr. Brooker being the only dissentient.

Messrs. Price, Waterhouse & Co. were then re-elected auditors, at a remuneration of £21, and the proceedings ended.

The Provincial Brush Electric Light and Power Company, Limited.

THE report of the directors of this company is very similar to that of the South Eastern Brush (see p. 428), with the exception of a few paragraphs which have reference to this company only. They are as follows:—

The company was incorporated on the 8th May, 1882. The first issue of capital (£100,000) was subscribed several times over, but after the lists were closed, and before the allotment was completed, some applications were withdrawn, and in consequence the total number of shares actually issued was 19,841. The accounts are made up to the 30th June, 1883. The result of the working to that date was a loss of £3,313 3s. 3d., and this amount is increased to £6,824 6s. 6d. by writing off £3,511 3s. 3d. from the concession, preliminary expenses, furniture and fittings' accounts.

. . . .

The directors at once turned their attention to organising the business—agents were appointed, an illustrated pamphlet and price list were widely circulated, and efforts made to obtain orders for electric lighting. Every manufacturing firm, public body, and resident in country mansions throughout the counties of Cambridge, Hertford, Bedford, Buckingham, Huntingdon, Norfolk, Suffolk and Rutland were communicated with, and installations of more or less importance were made at Aylesbury, Beccles, Bedford, Bishop Stortford, Bury St. Edmunds, Cambridge, Stowmarket, Sudbury, &c., but the directors found that until powers could be obtained under which house to house lighting could be undertaken from a central station, the business would be limited, owing to the indisposition of consumers to invest capital in expensive plant. They accordingly devoted their energies to the organisation of the business of the company on a comprehensive scale, similar in character to the existing system of gas supply.

. . . .

With reference to the first point, applications were made for Provisional Orders under the "Electric Lighting Act," for the supply of electricity in the towns of Cambridge, Luton, Ipswich, High Wycombe, Sudbury, Lowestoft, Bedford, Norwich, Bury St. Edmunds, and Great Yarmouth. The preparation of the form of Provisional Order, the negociations with the Board of Trade, town councils and other local authorities, involved considerable time, labour and expense, which resulted in the grant of Provisional Orders for the six first-named towns. The town councils of Norwich and Bedford having applied for powers, a preference was given to them in accordance with the provisions of the Electric Lighting Act, and in the other cases, owing to opposition, local enquiries would have been necessary which would have involved an expenditure the directors did not consider they would have been warranted in incurring in view of the number of orders actually agreed.

Provisional Orders have been granted to this company for the towns of Cambridge, Luton, High Wycombe, Lowestoft, Ipswich and Sudbury, the several Acts of Parliament receiving the Royal Assent on the 25th August, 1883. The directors propose that the above orders shall be worked, as far as practicable, through local companies, negociations as to which are now in progress.

. . . .

A question having been raised by a few of the shareholders as to the possession by this company of the right to the exclusive use of the Lane-Fox lamp, the directors fully dealt with the matter, and were advised that no grounds of complaint existed. Some proceedings have been taken by shareholders holding in the aggregate 327 shares, but they have been stayed pending the result of one action, the answer to which the directors are advised is a complete one.

At the first ordinary general meeting of the above company, held on Tuesday afternoon last in Cannon Street Hotel, under the presidency of the chairman of the company, Sir Michael Kennedy, there was a large attendance of shareholders.

The notice convening the meeting having been read by the Secretary, Mr. Alfred Germyn, the report and balance-sheet were taken as read.

In a lengthy speech the Chairman practically repeated the address which he had previously delivered at the meeting of the South-Eastern Brush Company. In referring to the work contemplated by the company, he said that works similar to those at Colchester, which had been described at the South-Eastern meeting, were about to be commenced at Ipswich. Sites for lighting stations were under consideration, and a house to house canvass had been instituted within the district described in Schedule A of their Provisional Orders, with the result that in only two cases had there been a refusal on the part of householders to take advantage of the electric light if the installation were made. The Chairman concluded by moving the adoption of the report and accounts.

Mr. Fessor seconded the motion, and in doing so remarked on the difficulty which had hitherto attended their operations. They had had, firstly, to survey their locality, find the special class of lights which would be required by probable customers there, and then draw up their Provisional Orders. He was proud to say that the Provisional Orders which that company had drawn up had served as the model for all that had been presented by other companies. Since they had begun work their gross profit had been £810 14s. 11d. They could hardly have expected any better result for a new industry during its first year. They flattered themselves they had got through the first and most difficult stage of the business, and that a pleasanter prospect lay before them. They had only to ask the shareholders to have a little patience and see whether the expectations that they confidently indulged in were or were not well grounded. (Hear, hear.)

Mr. Marnham asked if the £2,700 stated in the report to have been advanced to the Consolidated Company was the total sum promised, and to what extent they were pledged to supply money to the Consolidated Company. Could they not have an independent expert to report on the value of the work done in the factory? How much money was now in hand? Would the directors resist a petition to wind up the company? (Hear, hear.)

Mr. Hale said that as a shareholder had brought an action for the return of his money, he would like to know when that case would be brought to trial, and whether, if it went against the company, other shareholders would be entitled to have their money returned. As a man of business, he wished that the meeting would look at a shadier side of the question than the Chairman's speech had hinted at. The whole amount subscribed amounted to £47,000. Out of that they had paid for Brush concessions £25,000, for promoting the company £5,000, for directors' fees, &c. about £4,000, and for getting Provisional Orders £2,000: so there was £37,000 gone, and work done had only brought a profit of £466. (Hear, hear.) He wished to know if they would be at similar expense for lighting up other towns as that which they had already incurred for the towns they had already secured. (Hear, hear.) What was to be done? He was sorry that in answering that question they could not take the directors into their confidence, because they represented their own interests. (Hear, hear.) They (the directors) had everything to gain and nothing to lose by this company going on; the sacrifice only would be the shareholders. (Hear, hear.) They ought, he submitted in the first place, to cut down the expenses. He thought the directors' and officers' fees of £3,000 were enormous. (Hear, hear.) The seven directors had £2,300 among them, which was £340 each, or about £15 at each sitting. (Laughter, and hear, hear.) He thought the seven directors might be reduced to four, and might be content with £100 each. (Hear, hear.) Then he thought they should reduce their capital, as the South-eastern had done, for he thought the shareholders would not respond to any calls made. He was afraid of their future. He was a member of another electric company, whose prospectus was almost the same as their own, and it had spent everything and left nothing for the shareholders. He himself now did not believe a word that electric light circulars or directors said. (A voice: Nor anybody else; and Oh, oh.)

Mr. Stewart did not agree with the last speaker. He believed they had now laid the foundations of a good business and made very satisfactory arrangements, and now it would be suicidal to end the company. The proper course was to unite with the South-Eastern (Hear, hear), and so fairly reduce their expenditure. In no company that he knew had the directors worked harder than in this, and they had done much towards settling whether the electric light would be the light of the future. He hoped the company would go on, and he was sure there would be a more satisfactory report at next meeting. (Hear, hear, and No.)

Mr. Bellingham suggested that, as had been done by the Midland Brush, a special meeting of the shareholders should be held to pass a special resolution that the capital of the company should be limited to the amount already paid up. It was a cruel and a monstrous thing that with a bankrupt balance-sheet they should have to pay £2 10s. more for their shares. (Hear, hear.) The directors sat and fattened upon them. (No, no; hear, hear; laughter and hisses.) They ought to take no more fees, unless out of profits. He wished simply to ask the Chairman whether he would call a special meeting to consider whether they should limit their capital to the sum paid up. (Hear, hear.)

Mr. George Booth thought that winding up the company would be far preferable to reducing the capital. (Hear, hear.)

Admiral Inglefield said that it would not be to the interests of the shareholders to confide to them all that the directors knew. (A voice: Why not?) Why not? Because if all the directors knew was known to the world, rival companies would cut the ground from under their feet (Hear, hear), so that he thought they should confide more in their directors. If the shareholders did consider it wise to reduce their capital, they should form a committee to consult with the directors. Any idea of that sort could not be carried through at a general meeting; but there must be power left somehow for the company to have money to carry on its operations, and they must not tie the directors' hands and then expect their company to progress. (Hear, hear.)

In reply to a shareholder, the Chairman said that the directors held about 800 shares, none of them fully paid up.

Mr. Herbert Tritton Sankey, one of the directors, said that they had laid the foundation of a very profitable business, and they must of necessity have means to carry it on. The directors had no interest other than the shareholders themselves had; they had their reputation to consider, and they had embarked their means just as the shareholders had, simply because they believed the company would turn out to be a success. If they (the directors) were ready to do the work, the shareholders should be ready to find the means. (Oh, oh; and laughter.) He himself would take any man's shares who did not believe in the future prosperity of that company.

Mr. Bellingham: Will you take mine?

Mr. Sankey: Yes.

Mr. Bellingham: Then it's a bargain.

Mr. Sankey, continuing, said that they, as directors, were conducting the business on purely commercial principles with the object of securing a profit. They had sufficient intelligence to know whether the business was good or not; and they believed they had a good system, and that it would be a great success. (Hear, hear.)

Mr. Russell Crowe would ask the directors to pledge themselves to the meeting that they would make no call without taking the shareholders into their confidence, and putting before them the absolute necessity for it. (Hear, hear.)

A Shareholder asked if there was any likelihood of the sum of £2,191, put down as calls unpaid, being reduced?

Mr. Fessor said that that was now reduced to about £800.

Mr. H. O'Hagan wished they would take the same course as the South-Eastern had pursued that morning. They ought, in the first place, to write off 10 per cent. toward the concessions' expenses and 20 towards the preliminary expenses. They should carry their expenses to a suspense account, to be written off year after year. That was not a mere jugglery of accounts but would prevent next year's profit from being quite eaten up by expenses. He would propose that the heavy charge in the accounts of £6,824 should be carried forward to a special suspense account, to be written off in a series of years. (Hear, hear.) It might be well also to consider whether the 20,000 shares in the Consolidated Company should not be similarly treated.

A Shareholder said they should not take any rash steps, and they ought to consider whether it would not be most disastrous to their pockets and their interests to wind up the company. He thought they ought to believe that the directors would give the greatest attention to their interests. They certainly paid them large fees, but if they wanted men of standing, of intellect and of judgment, to govern their interests, they must give a fair reward for their services. If a satisfactory arrangement between that company and the South-Eastern were entered into, he was sure that next meeting would present them with more satisfactory results.

Amidst interruption and some confusion, Admiral Inglefield said that with the money in hand, it might not be necessary to make any further call.

Mr. Fessor said that they still had at their bankers a balance of £7,000—not much less than on 30th June last—so that they saw the money did not go very fast.

Mr. O'Hagan, amid considerable disturbance, suggested that one interrupter should be expelled from the meeting. (Hear, hear and Oh!) He went on to suggest that a committee should be formed of four or five of the principal shareholders and that the shareholders should leave themselves in the hands of that committee.

A Shareholder pressed for a distinct promise that no further call should be made.

Admiral Inglefield said that such a promise was of no use. If the company continued it must have money for its operations, and how were the directors to raise it? (Hear, hear.)

A Shareholder asked whether they could carry out their Provisional Orders without making a call, and whether they were the only people who had Provisional Orders in the towns in their district?

The Chairman said that one little difficulty as regarded the reluctance on the part of the shareholders to comply with further calls was, that they had expended a large sum of money in making preparations for doing work and getting Provisional Orders, and unless they had funds to carry on their operations, the whole of the expenditure already incurred would be wasted. (Hear, hear.) A proposal not to pay further calls, if needful, amounted to a proposal for winding-up the company, because they could not possibly go on without funds—they could not exist in a state of quiescence. Unless in six months from the date of the Provisional Order they took the necessary steps to comply with their requirements, the whole thing would lapse and they would lose all they had taken such trouble to gain. It was a suicidal proceeding to hold their hands at the stage of fruition and say that they would do nothing further. They were quite ready to confer with a shareholders' committee on whether they should make a call, or any other point; but they could not pledge themselves not to make a call, for that would be equivalent to committing the happy dispatch. (Laughter, and hear, hear.) They would pledge themselves to be guided by the opinion of any committee they might appoint. Let that committee consist of large shareholders. One gentleman had made himself prominent at that meeting who was a holder of only five shares, and they had had to sue him for the calls. ("Oh, oh!" laughter, hisses and interruption,) He appealed to them not to make a bear garden of the meeting. Proceeding to refer to the proposal to carry expenses to a suspense account, he did not think it was, speaking theoretically, the right thing to do, but they were ready to meet the shareholders there, if they wished it. As to the Consolidated Company, they were liable to the extent of £10,000, and no further, to that company. He thought the appointing an expert to look at their factory, as had been suggested, was hardly necessary. His experience was that the more experts, the more different the opinions. (Laughter.) The directors would most distinctly resist a motion for winding-up the company. No reasonable man could come to the conclusion that such a course would be any other than fatal to their interests. (Hear, hear.)

The Manager, Mr. Offor, then, at the request of the chairman, substantially repeated his statement as to the progress and prospects of the company, which he had made at the South Eastern Company's meeting. After referring to the position in Colchester of the South Eastern Company, he said that they themselves would be able to attain similar hopeful results, he believed, at Ipswich. No other Provisional Orders than theirs had been granted for any of the towns comprised in their district of operations. Of course, the Board of Trade would not allow them to pursue a dog in the manger policy in any town, and if they did not take advantage of their powers, they would not be able to exclude rivals. But they were not bound to do anything in the way of putting down plant for two years in any town, so that they had ample time before them to go steadily on and work out their installation. The object of the directors was to work these Provisional Orders with local capital. In fact, something of that sort would have to be done if electricity were ever to be laid on like gas and water. They only secured possession of the main thoroughfares of a town and left the rest to local enterprise. There was a feeling abroad that there was no demand for their lights. There never was a greater mistake. (Hear, hear). He found that right and left they had more work than they could well overtake. The amount of business being offered them was gigantic. His only fear was that they would not be able to supply the apparatus demanded. He had had to refuse an order for 1,000 batteries of their B T K system, because he could not guarantee to deliver them in two months. The shareholders, at all events, might make up their minds that they had as good a system of lighting as any other, and that they had the opportunities of turning that system to the best account. (Hear, hear).

After some desultory discussion and considerable confusion a resolution for the appointment of a committee was drafted and handed to the Chairman.

Mr. W. H. Roberts moved "that the following shareholders be and hereby are appointed a committee, with whom the directors express their desire to confer previous to making a call upon the shareholders. Admiral Inglefield, Mr. Stewart, Mr. Brodie, Mr. Braithwaite, and Colonel Jervis."

The motion was ultimately seconded and carried unanimously amid cheers and some hisses.

The Chairman then again moved the adoption of the report and accounts, subject to the modification that the item of £6,824 6s. 6d. in the profit and loss account should be carried forward to be dealt with hereafter.

The motion, seconded by Mr. Fessor, was also carried unanimously.

The auditors, Messrs. Price, Waterhouse & Co., were unanimously re-elected for the year commencing 1st July last, at a remuneration of 20 guineas.

On the motion of Mr. O'Hagan, the usual vote of thanks was awarded to the Chairman, who briefly responded, and the proceedings terminated.

The South African "Brush" Electric Light and Power Company, Limited.

THE first annual meeting of the shareholders of the above-named company was held at Cannon Street Hotel on Monday afternoon, Lieut.-Col. Geo. Coxon, chairman of the company, presiding.

Mr. Thos. J. Seel, secretary, having read the notice convening the meeting, and the minutes of the previous meetings (which were confirmed),

The Chairman said:—Gentlemen, as you have had the report in your hands some time, I presume you will take it as read, and will confirm the minutes also. Before asking you to second the resolution, which it is my duty to make, with regard to the balance-sheet and accounts, it will be necessary for me to make a few remarks. Before moving the adoption of the report submitted to you on the 13th inst., being the result of the operations of the company from the 15th May, 1882, the date of the formation of the company, to the 30th of June last, it will be necessary for me to offer some explanation on some points which, unexplained, would leave on your minds an erroneous impression or idea of the actual position of the company at this present time. In proof of this necessity, I may tell you that we have been written to with enquiries as to how it is that we have expended £10,000 to earn £5,000—(hear, hear)—and one gentleman notified his intention, in the absence of a satisfactory explanation, to move the winding-up of the company. (Hear, hear.) Gentlemen, we have no objection to take to that—it was a proper letter, and one such as we might expect to receive under the circumstances. Now, with reference to the item £5,202 17s. 7d., received from the service of lights to the Kimberley Town Council and Cape Town Harbour Commissioners from the 15th May, 1882, to the 30th June, 1883, it must not be supposed that we were in receipt of revenue all that time, nor that that sum represents the actual revenue at this moment, which may now be taken as about £10,000 a year; nor that the item in the same account of £10,945 17s. 3d., shown as expended for that period, represents the rate of the expenditure of the company since that date, or at the present time. It is very clear that a great deal depends upon two points. Moreover, this item of expenditure includes a very large amount of extraordinary or preliminary expenditure, travelling expenditure, exhibition of lights at Port Elizabeth, which can never occur again. The great bulk of that expenditure was embraced within that period of 14 months, whereas for only four months in one instance, and only two months in the other—speaking of our contracts—did we have the benefit of the income derivable from that expenditure up to the 30th June, 1883. In further explanation it should be stated that as the company started on May 15, 1882, heavy expenses commenced on that day—salaries of the staff, including manager, and wages expended on maintenance of machinery, which amounted to £4,354 1s. 7d. for the year, all going on from the 15th May. During August we engaged additional staff, two of whom turned out worse than useless, and were very expensive. Travelling expenses came to £767 13s. 6d., advertising £182 9s. 3d., and expenses of light at Port Elizabeth, £308 8s. 3d.—in all a total of £1,258 11s.—incurred for the most part at the commencement of our operations; and there will be no place for similar services in the future, for an insignificant sum will suffice.

A Shareholder: What sum, may I ask?

The Chairman: I should say, approximately, £300. From this you will see that unavoidable expenditure was going on at a great pace before we were in hailing distance even of remunerative returns. Now, as to the receipts. In September, 1882, 3½ months after the formation of the company, we had our 16 lights at Kimberley. These were running till March last, and we did not get to paid work till September, and we were for six months running those 16 lights at a loss the whole of the time. On the 1st March, 1882, 32 lights were started; so that for the whole period of 13½ months for which the accounts are made up, we had the full benefit of our 32 lights and the amount of capital invested in them for four months only. It does not require very close reasoning to show that a heavy loss must occur up to that time for this contract. With regard to Cape Town, up to the end of June we had the benefit of our contract with the dock authorities only for two months, simply because when we took the contract we were obliged to hire fuel and motive power, for which we had to pay an exceedingly high price. In April we commenced with our own engine, and are making now a fair profit upon that contract, as far as we can see at present. From the above facts it is perfectly clear that no other results than these could be expected from our first year's trading. Now we come to the consideration of two very important points, namely—What are we doing now, and what do we recommend in the future? With regard to the first question, I may say our gross revenue from existing engagements is £9,829 per annum; and our expenditure, as closely as we can calculate from data in our possession, may be taken as sufficiently low to enable us to cover expenses.

A Shareholder: All expenses?

The Chairman: Yes, Sir, *all* expenses. We, at present, look for no profit. We wish only to be on the safe side. Our manager holds very sanguine views for the future: we do not take them into account. We simply judge as closely as we can by the past of what we may be able to do in the future. When we say that our revenue will cover our expenses, we believe what we say is a fact. We believe it may be more, and it *may* be a trifle less. The operation of this light you all know is so uncertain; expenses crop up here which in the next month may be very much reduced. We have been paying £60 a week for fuel at Kimberley instead of £40. But that is past now; there is a prospect of cheaper fuel, for we hear there has been a heavy rain. And bear in mind, gentlemen, we cover expenses under great disadvantages; one I have quoted, about coal, and the second is a still more serious one. It is, that at the time we commenced operations there was a most unexampled depression at the Cape; so that we may fairly claim to be holding our own, and that, too, without taking very sanguine views of the future, which are entertained by our manager on the spot. The value and the success of the lights have been freely acknowledged, and the question of their being freely adopted is a question of cost, which has grown with the growth of the company. Had the state of commercial prosperity existing at the Cape at the time we started, continued to this time, ours would have proved a very successful undertaking. Neither should we be justified in setting aside the return of that state of things as a factor in considering our future course. On the completion of the railway to Kimberley, which the Government are vigorously pressing forward, and hope to complete as far as the Orange River by March next, we shall have the price of coal at Kimberley reduced. It has been as high as £24 a ton; but I believe on the completion of the railway it will be reduced to £6 or £7. Our expenditure for fuel has been £1,949 0s. 11d. So far from the light waning in popularity, our manager reports constant applications for it—chiefly for the incandescent light. But these applications are from places too isolated and scattered to pay, even with the staff and motive power already available, unless taken within the area of the established arc circuits. We have already given our reasons for declining some contracts asked for—some like that at East London. Now, having put you somewhat in possession of the position of our expenditure, I come to the second question—that of the future. If we could see our way, by the sale of our concessions and plant and machinery and cash in hand, to distribute an amount amongst the shareholders, it might, in view of the uncertainty, be the better course. But this, in the present position of affairs at the Cape, is out of the question. You may take this for granted. The only possible solution is to be found in holding on, so long as we can do so without serious loss, for better times. If better times come, the improved and enhanced value of our property will come with them. It is most obvious that if an improved state of affairs at the Cape comes, it will bring with it an improvement in the value of our property. Shall we do this, or shall we wind up the company now? ("No, no," and "Yes.") Shall we sacrifice the whole of the capital embarked, at the time when we are, so to speak, first feeling our legs, for the sake of the distribution of 4s. per share? Gentlemen, your board does not recommend that course, which I have only gone into because I know it has been freely mooted amongst you, from a natural ignorance of our real position. What we do recommend is, that we reduce the shares to £3 shares, leaving a liability of 10s. only on each share, instead of £2 10s., which, I may inform you, is by no means a costly operation; and that we continue our work on the lines I have indicated, for the present. Pray remember that we can call you together at any time—in three, or six, or nine months; and, depend upon it, should your interest demand it, we should not defer the time a single day. Having so far indicated our views, and told you what we recommend—we are only a small number of directors on the board, but we have studied the matter, and we now tell you what we think is for the best. I now move the adoption of the report and accounts.

Mr. Porter Rhodes (a director) seconded the motion.

Mr. Clark (a shareholder) said he intended to make some lengthy remarks, but he considered the chairman's explanation satisfactory. He thought, however, they must be watering their liquidation if they could only give 4s. a share. He should recommend that they reduce the shares to their present price—£2 10s. He did not like the liability. It was a serious thing. He would move, as an amendment, that the shares be reduced to £2 10s. each.

Mr. Thomas seconded.

Mr. Dickson sounded a note of warning against cutting the shares down to £2 10s. If they did that and then wanted to gain a little more money, it would be exceedingly unsatisfactory to have to prepare for legal expenses. If they said no further calls would be made without the consent of the shareholders, they had the matter entirely in their own hands. It would be a pity to cut themselves away, for the time must come when they got something that would pay them very well, and they would want some more money. Let them pass a resolution that no further calls be made without the sanction of the general body of the shareholders, but not further reduce the shares.

A Shareholder said that the principal asset was put down as £25,000 as the value of licenses. Was such a value seriously suggested by the directors? As to the item of 5 per cent. knocked off for depreciation of machinery, that was surely insufficient. He doubted whether 10 or 15 per cent. would be enough.

The Chairman: From the time the machinery has been in operation, 5 per cent. is more than sufficient. We are not forecasting the depreciation for next year. (Hear, hear.)

Mr. J. C. Howe said that he had recently returned from South Africa, and his experience differed considerably from the views expressed by the chairman as to the value of the machinery. Even 20 per cent. was hardly sufficient for depreciation, considering how electric light machinery was valued there. The light was being depreciated there every day, and the accounts would show that they had to allow a certain amount off to the Corporation. As there was no chance at all of a renewal of the Kimberley contract, and as they had paid the larger portion of their expenses, he considered it simply nonsense to attempt to carry on the company. It had been very properly asked whether the directors should still receive £500 from a concern which had ended so disastrously. It was no doubt right to reduce the value of the shares, but he did not understand what the directors wanted to do with the extra 10s. of the £3 which they had proposed; he supposed the shareholders would be responsible for it when the occasion arose. The authorities of East London would have nothing to say to their light.

The Chairman said that that statement as to East London was groundless, nor was it the first from that gentleman which demanded correction. The report would show that if the whole of

Mr. Howe's statements were to be judged by such a sweeping assertion as the one he had last made, his speech could scarcely carry very much weight. He contended that 5 per cent. depreciation was ample allowance for the time up to the end of June last, during which the machinery had been used. With regard to the town council of Kimberley, he thought that in a meeting of London merchants and of gentlemen connected with the business of the country, the less they said about it the better. Its conduct towards their company had not been such as would bear very much ventilation. The company had a fair, honest and honourable contract with the members of that council, and yet they had taken every possible means, both fair and foul, to oppose them. They had had, indeed, no fair opportunities of attack except by the occasional and inevitable failure of the light for a time; but they had actually attempted to deprive them of their revenue from the light for 24 hours because it had gone out for one. From the very first they had had spies trying to spy out every defect. He denied and defied any honest man to bring one single item of proof that their lights had been a failure at Kimberley. Every disinterested man had been in favour of the lights. They were equal to any lights elsewhere. One of their board—Mr. Atkinson —was out at Kimberley now, and they had there besides an excellent electrician, Mr. Cozens, who had done himself honour by his pluck and determination. (Hear, hear.) The lights at Cape Town had been pronounced better than those at Eastbourne, which were supposed to be pattern lights on the south coast, and those were the same lights as at Kimberley.

Mr. Howe repeated that there was no probability of the Kimberley contract being renewed. He had meant no attack on the way in which the contract had been carried out, although he saw that the lights were very deficient, and knew that the company had to make large allowances to the corporation. At any rate, they had no contract at East London, and no likelihood of one.

The Chairman said that they had not only not made abatements to the Kimberley town council, but the council had made abatements to them which they had accepted. The payments to the company from Kimberley, less deductions, had been received without prejudice, and moreover, they had taken counsel's advice in London, which would guide them very distinctly in their dealings with those gentlemen.

A Director, in reply to a question, said that the concession and plant shipped out cost the vendors about £10,000. The vendors had over £13,000 worth of stock in the company. That investment showed their faith in it.

The Rev. H. I. Johnson asked how much of the £25,000 mentioned in the accounts did the company possess in the shape of plant and machinery?

The Chairman: £3,500.

The Rev. H. I. Johnson asked if the £3,000 and the £43 2s. 10d. on the balance-sheet as an asset was also included in the creditor's side of the profit and loss account?

The Chairman: Yes, the bulk of it.

Mr. Johnson: So that the £5,200 put down as creditor's account on profit and loss sheet includes the £3,000 still owing?

The Chairman: Yes.

Mr. Johnson said that it also appeared that for £2,000 received they had spent in salaries, wages and general stores, £7,000, leaving out of account travelling, water, steam engine, &c. If the expenditure were to go on as in the past, it would amount to not far short of £10,000 per annum, for a gross revenue of about £9,700. He was afraid, in view of the past management, that the shareholders would conclude that the directors were of a sanguine temperament. He was disposed to think that in a few months they would be worse off than now, instead of better. Was it desirable, in view of the present depressed state of affairs at the Cape, to wait a better time in order to sell their plant? It was only the steam engines they would be able to sell to any advantage, for he was afraid that the Brush system was not the system of the future.

A Director: There is no system but the Brush that will work the 7½ miles we have at Kimberley with one wire.

The Rev. H. I. Johnson: How about the Metropolitan Railway Company?

The Chairman: That has only been in existence a week.

The Rev. H. I. Johnson expressed his opinion that the plant should be disposed of at the best possible prices, that all the salaried officers should be at once discharged and the company wound up. There would then remain, if the £3,000 had to be paid, £10,000 in the directors' hands, which would give the shareholders 10s. per share.

The Chairman said that he had been speaking of a state of things six months old. They had certain agreements with the staff and a running contract at Kimberley. He could conceive nothing more fatal than liquidating the company. As to their sanguine temperament. they had been a little afraid of their exceeding cautiousness. Although their manager had been very sanguine, he (the chairman) had not mentioned one single thing in that direction, or used the word "hope" or "I think." He had simply stated facts, and had asked the shareholders which of two alternatives they preferred. If they had to sacrifice anything they could not do it at a worse time than the present. From figures in the directors' possession the company was now paying its way, and in three months they might be in a better position to liquidate. The eyes of the directors had never been off the question of how best they could dispose of concessions here and there, and realise what was realisable of the capital invested in the colony. The Kimberley contract terminated in August, 1884.

Mr. Tomkins asked if there was any chance of a renewal of the contract.

The Chairman said it was on the cards that at the end of the contract there might be another town council, for town councils did not hold their office in perpetuity. It was doubtful whether the merchants and gentlemen of Kimberley would be willing to forego the light after having had it for so long a time. (Hear, hear.)

In reply to another query, Mr. Griffiths, one of the auditors, said that they had no reason to doubt the accuracy of the accounts, most of which were prepared by highly respectable people abroad, and bore evidence of their truth upon them. He ventured to impress upon the shareholders that the idea of liquidating now would be a bad course to adopt. The cost of getting rid of the contract would amount to more than that of carrying on the business for another year.

The Chairman said that they would have to pay a certain amount at Kimberley if they gave up the contract, and from what they knew of the corporation that would not be a mere matter of form.

Mr. Howe said he knew that the Kimberley corporation had a large deficiency at their bankers', and they would probably hail the opportunity of reducing their expenses.

The Chairman asked Mr. Howe what the rate of the tax for the light was that pressed on the people of Kimberley so much. He would like them to be satisfied as to the relief which would be felt if the company withdrew from the contract.

Mr. Howe said that he did not come there to give them information. (Laughter, and "hear, hear.")

A Shareholder asked what would be the incidental expenses of reducing the capital of the company.

The Chairman: I think about a minimum of £50 and a maximum of £100.

The adjournment of the meeting was then proposed and seconded from the body of the hall.

A Shareholder asked to what extent the accounts were supported by vouchers.

Mr. Griffiths did not think that the amounts unsupported, which were all small, would reach anything like a total of £500.

After further desultory discussion, it was understood that the directors would call an extraordinary meeting on the question of reducing the shares. As to the amount to which they should be reduced, the chairman stated that their solicitor advised that it could be altered legally by amendment.

On the motion of the chairman, the statement of accounts was then adopted with one dissentient. It was further proposed and carried that the auditors should be re-elected, their fee to be 20 guineas.

The usual vote of thanks to the chairman terminated the proceeding.

The Hammond Electric Light and Power Supply Company, Limited.

ON Monday, at noon, Sir Charles Young, Bart., presided at an extraordinary general meeting of the above company, at the Cannon Street Hotel (which was attended by one shareholder), for the purpose of confirming the following resolution, which was agreed to at a previous meeting held recently:—"That the directors of the Hammond Company be authorised to create and issue 16,000 deferred shares of the nominal value of £5 each, on the terms of the agreement already approved by the Hammond Company, and authorised to be entered into and carried into effect with the Ferranti Company."

The Chairman remarked that the matter was so fully gone into at their previous meeting that he need not repeat the facts that were then stated, and would simply propose the resolution.

Mr. Robert Hammond seconded the proposition, and in doing so said he should like to remark that between the two meetings the Ferranti instalment made at the First Avenue Hotel had been started, and that it gave, on Thursday, the opening night, immense satisfaction. One thousand lights were running there from one machine.

The shareholder present approved of the passing of the resolution, and the proceedings ended.

The Metropolitan (Brush) Electric Light and Power Company, Limited.—Mr. Keatinge Pollock has ceased to be manager of this company, in consequence of his dissent from the policy of the board on a point of principle. Letters will still find him, addressed 110, Cannon Street, E.C.

Direct Spanish Telegraph Company, Limited.—We are informed by the above company that during the interruption of the Falmouth-Bilbao cable, telegrams for Bilbao, Madrid, and other places in Spain, can, during the interruption, be forwarded by the route of the Eastern Telegraph Company.

The Pilsen-Joel and General Electric Light Company, Limited.—We hear that Major-General Henry Hopkinson has resigned his position, as director of this company, owing to his dissent from the policy of the majority of his colleagues at the board.

The Jablochkoff Electric Light and Power Company, Limited.—The petitions of R. Everitt and another, which were to have been heard early this week by Mr. Justice Pearson, are down for hearing to-day.

TRAFFIC RECEIPTS.

The West Coast of America Telegraph Company, Limited. The October receipts were £9,800.

The West India and Panama Telegraph Company, Limited. The estimated traffic receipts for the half month ended the 15th November are £2,248, as compared with £1,579 in the corresponding period of 1882.

CORRESPONDENCE.

The Electrical Resistance of the Human Body.

I have read with considerable interest the papers on this subject by Dr. Stone, which you have on various occasions republished from *Nature*. Your own remarks on this gentleman's experiments appear to be confirmed by later tests made by Mr. W. Lant Carpenter, briefly referred to in your notice of the meeting of the Physical Society. Perhaps Mr. Lant Carpenter might be induced to favour the readers of the ELECTRICAL REVIEW with further particulars regarding his experiments, and more extended information regarding the influence of the skin upon the measured resistance of the body.

Epidermis.

The "Glasgow" or "English Mechanic" Receiver.

That "Brevity is the soul of wit" is generally admitted, but it seems to my dull comprehension, that the "brevity" of your correspondent's ("D") communication, published in the REVIEW of 24th inst., does not verify that pithy saying, but renders his meaning obscure; and at the same time his attempt at irony is ridiculously thin. As a rule, I treat with silence anonymous writers, but I confess to have within me that instinctive impulse which impels the Irishman to use his shillelagh upon every exposed head, and which impels me to criticise any remarks touching myself, whether they be anonymous or not.

In the first place, your correspondent confounds "the Glasgow" receiver with that described in the *English Mechanic* of 1876, which latter he names the "English Mechanic."

These two receivers are totally different instruments. The "Glasgow" receiver has an "iron disc screwed at its edge to the outer casing, and touching it at no other point."

The receiver described in the *English Mechanic* has a membraneous tympan, like gold-beater's skin, with a piece of iron attached to its centre.

The former instrument was not included in Bell's patent of 9th Dec., 1876, and the latter was included in it, but was disclaimed on 13th Feb., 1878, hence, both of those instruments are public property.

Your correspondent says that the Globe Telephone Company is manufacturing and using such instruments, and asks whether "there is anything to prevent other parties from manufacturing and selling such instruments, if it be not an infringement of Bell's patent?" Common sense would certainly suggest to anyone that, if an instrument be not an infringement, it can be made and sold by anyone.

Perhaps it will gratify your correspondent if I deliver my opinion *ex cathedra*.

In regard to the "Glasgow" receiver, it being public property, I am of opinion that, as the construction which has been judicially put upon the Bell patent, any modification of it which does not include a plate of any material capable of inductive action, or any equivalent thereof, "held down all round its edge," is subject matter for a good and valid patent, and will not be tributary to any claim in Bell's patent.

In regard to the receiver described in the *English Mechanic*, I am of opinion that, on the construction which has been judicially put upon the Bell patent, a diaphragm of any material, which is of itself stiff, or which is rendered stiff by any process whatever, having attached to it any material capable of inductive or magnetic action, placed in front of the poles of a magnet, held down all round its edge, comes clearly within Bell's patent.

I refer your correspondent "D" to my letters, published in the REVIEW, on pages 191 and 230, for my opinion *in extenso* on those forms of receivers.

Should your correspondent wish to have my *authoritative* opinion on the "Glasgow or English Mechanic receiver," which, he writes, are being manufactured and sold by the Globe Company, I will comply with his request if it be accompanied by the instruments and a liberal fee.

W. C. Barney.

Nov. 26th, 1883.

Atlantic Cables.

In the ELECTRICAL REVIEW of the 10th inst., I drew attention to the difference in the cost of cables laid in one length or span between England and Nova Scotia, and cables laid between the same coasts in two lengths or spans *viâ* the Azores, also to the difference in the amounts to be put by annually to the renewal fund.

I now propose to amplify on that letter and compare the results of working by each route.

Mr. Weaver, in one of his letters, says "that, unless a new company would undertake to reduce the existing tariff of 2s. per word to 1s. per word or less, it would be hopeless for promoters to endeavour to raise capital for the purpose merely of multiplying the number of cables already laid which are more than sufficient to carry all the traffic at present rates."

I therefore take it as granted that in any new Atlantic cable project the tariff rate must not exceed 1s. per word; also, that the working expenses under the present able management cannot be reduced, and that the amounts now annually placed to the renewal funds are absolutely necessary.

In your article of September 22nd, and in Mr. Weaver's replies, you both assume the gross receipts per annum at 1s. per word (based upon the working by the associated companies for six months, viz., from August 1st, 1881, to January 31st, 1882) to yield only £607,640. Mr. Weaver has also stated that new cable companies must not calculate upon getting more than their share per cable of the traffic—thus eight cables being already laid—two new cables would not earn more than $\frac{2}{10}$ths of the whole traffic. Basing my calculations on this data the comparative results of working by the two routes will be as follows:—

	£.	£.
The two-span route *viâ* Azores—cost of two cables...		720,000
Share of gross receipts per annum at 1s. per word—$\frac{2}{10}$ths of £607,640 ...		121,528
Working expenses and repairs ...	50,000	
To renewal fund 17·7 per cent. on the cost of one section, being the same proportion as the Anglo-American Company now puts by	31,860	81,860
Balance 5·5 per cent. on £720,000		£39,668
The one-span route direct—cost of two cables		1,200,000
Share of gross receipts per annum at 1s. per word—$\frac{2}{10}$ths of £607,640 ...		121,528
Working expenses and repairs	50,000	
To renewal fund 11·9 per cent. on the cost of one section instead of 17·7 as per two-span route	71,528	121,528

Thus, by the one-span route there would be a deficiency of £34,672 in the usual amount to place to the renewal fund, and, of course, leaving nothing for dividend; whereas, by the two-span or Azores route, the full amount can be placed to the renewal fund, and a balance left equal to 5·5 per cent. on the cost of the cables.

I now extend the comparison to the Associated Companies, and the result to the latter is similar to the one-span route.

	£.	£.
Gross receipts per annum at 1s. per word		607,640
Deduct $\frac{2}{10}$ths as the share of two new cables		121,528
		486,112
To be divided between the Associated Companies in the proportions stated by you in the REVIEW, viz, :		
To the Anglo-American Company (4 cables), 48·825 per cent. of receipts	237,344	
To the Direct United States Cable Company (1 cable), 16·275 per cent. of receipts	79,115	
To the Pouyer Quertier Cable Company (1 cable), 12·4 per cent. of receipts	60,278	
To the American Telegraph Cable Company (2 cables), 22·5 per cent. of receipts	109,375	486,112
The Anglo-American Company gross receipts would be		237,344
Working expenses and repairs as at present, about	116,000	
To place to renewal fund, instead of £150,000 as now considered necessary	121,344	237,344
Being a deficit of £28,656 to the renewal fund, and leaving nothing for dividend.	......	......
The Direct United States Cable Company gross receipts would be ...		79,115
Working expenses and repairs, as at present, about	39,572	
To place to renewal fund, instead of £42,872 as now considered necessary	39,543	79,115
Being a deficit of £3,329 to the renewal fund, and leaving nothing for dividend.	......	......
The Pouyer Quertier Cable Company gross receipts would be		60,278
Working expenses and repairs, same as preceding	39,572	
To place to renewal fund, instead of £42,872, as now considered necessary	20,706	60,278
Being a deficit of £22,166 to the renewal fund, and leaving nothing for dividend.	......	......
The American Telegraph Cable Company gross receipts would be ...		109,375
Working expenses and repairs ...	50,000	
To place to renewal fund, instead of £123,900, as now considered necessary	59,375	109,375
Being a deficit of £64,525 to the renewal fund, and leaving nothing for dividend.	......	......

The deficiencies to the renewal funds of the Associated Companies, as above-mentioned, at the 1s. tariff, would amount to £118,000 per annum.

Should the annual receipts exceed £607,640, which I believe would be the case, and to a very considerable extent, the proportion to the Azores route would go to increase the dividend; whilst the directors of the Associated Companies should, as cautious men of business, place their proportion to their renewal fund towards making good the deficiency.

I believe the above statements to be a fair comparison between the several routes if worked at a 1s. tariff, and I submit them to the consideration of those who it is reported are about to lay cables in one span across the Atlantic, as such results should cause them to think twice before they sink any money in such a venture, for whether within the Association of Companies or outside of it the prospect of a return for their money is not encouraging.

I find there are other advantages which would result from making the Azores an intermediate Atlantic telegraph station, which I do not now touch upon, but hope to do so on another occasion.

A. O.

November 27th, 1883.

Atomic and Equivalent Weights of Elements.

Some time ago, I attended at a School of Electrical Engineering in London, for a six months' course of instruction. On 22nd November, 1882, one of the masters gave the following questions :—

1. How is it that in the case of tetrad elements the atomic weights are double instead of four times greater than the equivalent weights?

2. How is it in the case of triad elements, such as Au.''' and N.''' the atomic and equivalent weights are the same?

I have always understood that the atomic weight of an element never varies, that the quantivalence or valency expresses the number of hydrogen or other monad atoms which one atom of the element in question is capable of replacing, and that the chemical equivalent weight of an element expresses the weight which is required to be substituted for one part by weight of hydrogen in its compounds, and that the elements are divided into groups called monads, diads, triads, tetrads, &c., according as they require 1, 2, 3, or 4, &c., monad atoms to satisfy them.

I also believe some elements possess a varying quantivalence and that the chemical equivalent weight varies therewith.

It therefore seems to me that the above questions are *absurd* and imply what is *not true*.

I should be glad to know if the following table is correct.

Element.	Compound.	Valency.	Weights.	
			Atomic	Equivalent
Au'''	$Au\ Cl_3$	Triad	197	65·'6
N'''	$N\ H_3$	Triad	14	4·'6
N^{V}	$N\ Ol_5$	Peutad	14	2·8
Sn''	$Sn\ Cl_2$	Diad	118	59·
Sn'^{v}	$Sn\ Cl_4$	Tetrad	118	29·5

If my view of the subject is correct, can you explain how a teacher, in what ought to be a good school, could give such absurd questions.

J. G. Carswell.

37, Victoria Road, Old Charlton,
November 20th, 1883.

[We are not sure whether chemists are yet agreed upon some of these points, but we think our correspondent's questions would be more suited to the columns of the Chemical Society's Journal.—EDS. ELEC. REV.]

Incandescence Lamps for Lectures.

Can you or any of your correspondents inform me if there is any *convenient* means by which a single Swan or Edison incandescent lamp of moderate candle-power can be lighted, say, for a couple of hours at a time for the purpose of illustrating a portion of a lecture on modern lighting which I am about giving at our Institute.

I find that such a lamp can be lighted for a certain time by means of a 6-cell battery with bichromate bath, but the apparatus is so large and unwieldy (by reason of its weight and size) that it is almost an impossibility to move it about or accommodate it to the resources of an ordinary lecture room.

If the lighting of a lamp such as I have described can be arranged by a less heavy apparatus, and at a moderate cost, I shall be pleased to be communicated with.

Enquirer.

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